ETMS Software Requirements

Name:	Marv Todd
Date:	June 10, 2002
Requirements Described:	TSD FCA Functions
Document Version:	2.6
Target Release	7.5

Revision History

Revision	Date	Authors Initials	Description of the Change
Version 1.1	Dec. 8, 2000	MT	Initial Version
Version 1.2	June 15, 2001	MT	Initial modifications for Release 7.3
Version 1.3	June 26, 2001	MT	Additional modifications for Release 7.3
Version 1.4	June 27, 2001	MT	Additional modifications for Release 7.3
Version 1.5	July 13, 2001	MT	Additional modifications for Release 7.3
Version 1.6	July 16, 2001	MT	First version to be distributed outside of TSD Development.
Version 1.7	July 25, 2001	MT	Modified FCA database structure and added defaults for dialog boxes.
Version 2.0	August 20, 2001	MT	Modified to include FEA terminology
Version 2.1	November 7, 2001	MT	Edited to correct several problems
Version 2.2	December 14, 2001	MT	Included changes requested by CRCT Core Team and the FCA Dynamic List function.
Version 2.3	December 27, 2001	MT	Edited the FCA Dynamic List function
Version 2.4	February 6, 2002	MT	Edited the FCA Dynamic List functions
Version 2.5	April 15, 2002	MT	Added changes for Release 7.5
Version 2.6	June 10, 2002	MT	Additional changes for Release 7.5

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1.0 Overview

The purposes of the Flow Constrained Areas (FCA) functions shall be to allow the user to define FCAs, share those definitions with other ETMS users, and obtain information pertaining the flights that are predicted to intersect the FCA. To distinguish operational usage of the FCA functions, the FAA has defined the terms Flow Evaluation Area (FEA) and Flow Constrained Area (FCA). From the perspective of the ETMS software, these terms have the same meaning. When the FCA functions are used by Traffic Managers to evaluate the flow of air traffic in their airspace, the term Flow Evaluation Area will be used. The FAA will use the term Flow Constrained Area to indicate to other FAA users and airline users that the traffic flow is constrained in the area defined by the FCA. FCAs will be made Public and shared with the airlines whereas FEAs will be only be used within the FAA. This document will use the term FCA to mean both FEAs and FCAs.

The FCA functions shall consist of four major components: the TSD User Interface functions, the List Server functions, the FCA Database functions, and the FCA Traffic Analyzer functions. This document defines the software requirements for the TSD FCA User Interface Functions. Separate documents describe the software requirements for the other FCA functions.

The purposes of the TSD FCA User Interface functions shall be to allow the user to define FCAs, manage the FCA definitions, display FCAs on the TSD display, and obtain information pertaining to the flights that are predicted to intersect an FCA. The purpose of the FCA Database functions is to allow a user to share the FCA definitions with other TSD users at the same or another facility. The purposes of List Server FCA functions are to generate reports that list the flights that are predicted to intersect an FCA. The purpose of the FCA Traffic Analyzer functions is to determine the flights that are predicted to intersect an FCA.

1.1 Scope

This document describes the TSD, List Server, and FCATA software requirements for the FEA/FCA functions that were implemented in Release 7.2, 7.3, 7.4 and those that shall be implemented in Release 7.5. Additional features are planned for subsequent releases; however those features are not described in this document except as a note to the developers for planning purposes.

1.2 References

1. ETMS Software Requirements for RRSVR & RRHUB Reroute Functions, Version 2.8, February 2002.

2. ETMS Software Requirements for FCA Database Functions, Version 2.5, January 2002.

3. ETMS System Requirements for Flow Constrained Areas Function, Version 1.4, May 2001.

4. ETMS System Requirements for FEA/FCA List Function, Version 1.0, September 7, 2001.

1.3   Summary of Changes for Release 7.5

The following is a summary of the changes in the TSD FEA/FCA functions for Release 7.5:

- An option will be provided to disable the automatic showing of newly defined shared or public FEA/FCAs. This option will be added to the FEA/FCA Preferences dialog box. When this feature is disabled, the TSD will not display shared or public FEA/FCAs unless the user has specifically selected the individual FEA/FCA to be shown in the Select FEA/FCA dialog box.

- The FEA/FCA Timeline dialog box will be modified to display the total number of flights that intersect the FEA/FCA during the selected time intervals. This count will be different from the number that one would get by adding the total counts for each of the selected intervals since it would count flights only once even if they are in the FEA/FCA during more than one 15-minute interval.

   ****** (The following change will require List Server changes. These changes that may not make 7.5)********
   The FEA/FCA Timeline will also be modified to generate a list request for a report of the flights that are predicted to intersect the FEA/FCA during the selected intervals; however this report will not be bucketed by 15-minute intervals. Each flight will only be listed once. This list request will be in addition to the current FCA Report function.

- A sort function will be added to the FEA/FCA Dynamic List. The user will be able to specify the primary, secondary, and tertiary sort parameters. A dialog box, similar to the sort function in Excel, will be provided that will allow the user to specify these sort parameters.

- The FEA/FCA Information Dialog Box will be enhanced to display the flight filters that have been defined for the FEA/FCA.

- The Create, Edit, and Copy FEA/FCA dialog boxes will be enhanced to allow the user to define custom FEA/FCAs as a circle or by specifying the latitude & longitude of individual polygon points. The circle option will be implemented by allowing the user to specify the center point and radius of the circle. (This will be similar to the Range Rings function.) The Latitude/Longitude feature will be implemented by adding an additional tab to these dialog boxes that will allow the user to enter or edit the latitude & longitude of the points for a custom polygon. This tab will not be available if the user selects a NAS Element FEA/FCA.

- The Select FEA/FCA dialog box will be modified to allow a user to edit or delete a Shared FEAs only if a user at the same site created that FEA. This will prevent users from editing or deleting a Shared FEA that was created by another site.

- When an FEA file is retrieved, the name of the FEA will be changed to be the same as the file name instead of the original name of the FEA that was saved.

- When an FEA/FCA is created as a NAS element, the FEA/FCA name field, if empty, will be filled in with the name of the NAS element.

- The FEA/FCA Dynamic List will be enhanced to display the abbreviated route as well as the full route. The Mitre algorithm will be used to create the abbreviated route text from the full route text. The abbreviate route will be provided as a column option in the Dynamic List.

- The adaptation function in the FEA/FCA Preferences will be enhanced to allow the user to save and recall the column preferences for the FEA/FCA Dynamic List.

- The FEA/FCA Dynamic List will be enhanced to provide the following new features:

  - The Dynamic List will display only those flights that intersect the FEA/FCA during the 15-minute intervals that have been selected in the FEA/FCA Timeline. This change will make it consistent with the current report option.

  - When the Dynamic List updates it will maintain the previous scroll position. The same rows should be displayed before and after the update. This way the user will see roughly the same flights before and after the update.

  - The background color of the list will be white. This will allow color to be used to designate attributes of flights such active/inactive.

  - A feature will be added to the Dynamic List that will allow the user to stop the list from updating.

  - The sort feature in the Dynamic List will be enhanced to allow the user to specify primary, secondary, and tertiary sort criteria.

- The list of NAS Element types will be changed to eliminate Low Fix, High Fix, and Superhigh Fix and replace them with a single category of Fix. This will allow the users to filter by altitude.

- The file that provides the list of sites in the option menus in the Shared Sites tab will be changed to a file that only includes the operational ETMS sites and has the ARTCCs first in the list. This file will be prepared and distributed with the 56-day update.

- The format of the FCA file will be modified to include the parameters for the circle FCA and the Reason.

- The format of the fca_flights file that is returned from the FCATA when an FCA is examined will be changed to allow the FCATA to include the abbreviated route in the data for each flight. The FCATA will construct the abbreviated route string using the algorithm that has been provided by Mitre. Briefly this abbreviated route string contains the origin and destination airports and three contiguous elements from the original route string that are near or within the FCA.

- The FCA Bar Chart will indicate whether peak counts or total counts are being displayed.

1.4   Design Overview

The FCA functions shall support three types of FCAs: Public, Shared, and Private. Specialists at the ATCSCC will typically create Public FCAs and those FCAs will be shared with all ETMS users. Users at ETMS field sites will create Shared FCAs and they will be shared with other ETMS users within their facility, with users at designated ETMS sites, and with ETMS users at the ATCSCC. Any TSD user may create Private FCAs for viewing on their workstation only.

The high-level system design concept for the TSD FCA functions is depicted in Figure 1.1. This concept is summarized as follows:

- The TSD user will create an FCA by drawing the polygon on the TSD and entering information into the FCA Definition dialog box.

- The TSD shall send the FCA definition to the FCA database that is maintained by the RRHUB process at the hub-site. To accomplish this, the TSD shall send the data to the RRSVR at its local site. The RRSVR shall then forward the data to the RRHUB process at the hub-site. The RRHUB process shall process the message and respond directly to the TSD by sending a confirmation or error message.

- When the RRHUB receives an FCA definition for a Public FCA, the RRHUB shall rename that FCA with a name that is retrieved from the Central Name Server. The Central Name Server is an Oracle database at the Command Center. The FCA names shall have the format "FCAnnn" where "nnn" is a sequence number that starts with "001" at 0900Z each day.

- When an FCA is edited or deleted, the TSD shall send the update or delete messages to the RRSVR process at the remote site. The RRSVR process shall forward all update or delete FCA messages to the RRHUB process at the hub-site.

- Whenever an FCA is updated or deleted, the RRSVR process shall broadcast update or delete messages to all TSDs running on its local site and other designated sites.

- When the TSD initializes, it shall request the current FCA_index data from the RRSVR process on its site (or another designated site). The RRSVR shall respond with the name of a file that contains the FCA index data. The TSD shall read the FCA_index data file and it shall determine if its internal data for FCAs is in sync with the RRSVR database. The TSD shall request the current data for any FCAs that are not in sync with the RRSVR database.

- The RRSVR shall broadcast a message regarding FCA database index data on a periodic basis to all TSDs on its site and other designated sites. (These are called heartbeat messages.) When the TSD receives this message, it shall read a file containing the FCA index data. The TSD shall request the current data for any FCA that is not in sync with the RRSVR database.

- In order to keep the RRSVR databases in sync with the RRHUB database, the RRHUB shall send an FCA_index data file on a periodic basis to all RRSVR processes. When the RRSVR receives the heartbeat message, the RRSVR shall request the current data for any FCA that is not in sync with the RRHUB database.

- The TSD shall request FCA flight data from the FCA Traffic Analyzer (FCATA) process that is running at the hub-site. The FCATA shall respond with a file that contains data regarding each of the FCA flights.

- The TSD shall request reports from the Listserver regarding FCA flights. When the Listserver receives this request, the Listserver shall request the FCA flight data from the FCA Traffic Analyzer (FCATA) process that is running at the hub-site. When the Listserver receives the flight data file from the FCATA, it shall send the file to the FTM. The FTM shall respond with a file that contains additional data regarding each of the FCA flights. The Listserver shall then create a report from this data. This report shall conform to the List Request specifications regarding the content and format. The Listserver shall send this report to the TSD, which shall then display the report.
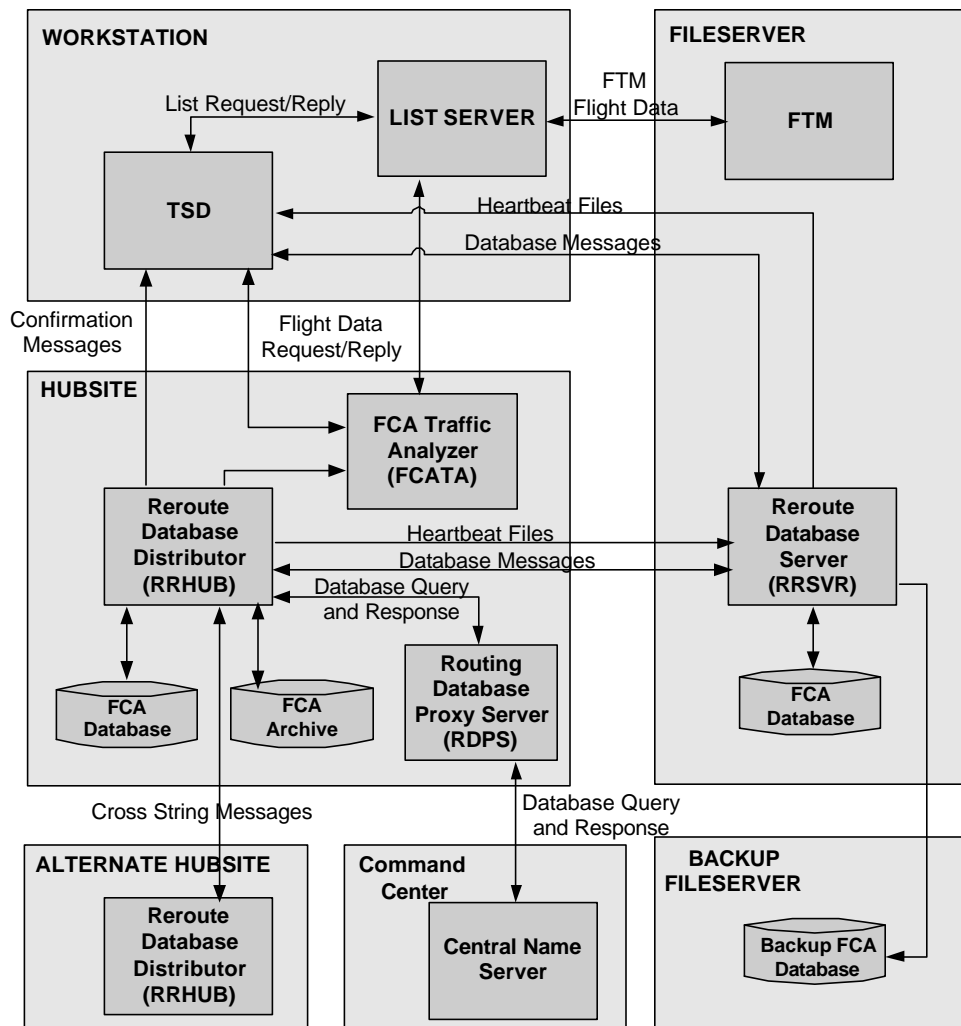
Figure 1.1   High Level System Design

When an FCA is created, the user will designate whether it is a Private, Shared, or Public FCA. All users will be able to create Private and Shared FCAs. Only users at designated sites, typically the ATCSCC sites, will be allowed to create Public FCAs. When a FCA is created, the TSD will send an update message to the FCA Database Server (RRSVR) on a designated site's fileserver.

The RRSVR shall forward the update message to the FCA Database Distributor (RRHUB) process that is running at the hub-site. The RRHUB process shall validate the update message and respond to the TSD with a confirmation or an error message. If the request is valid, the RRHUB shall then send the update message to the RRSVR processes at the remote sites. When the RRSVR process updates the FCA database on the fileserver, it shall notify all TSDs at designated sites of the database update.

The RRHUB process will maintain a database of all FCAs at the hub-site. However a copy of a portion of the FCA database will be maintained on the fileserver at each local site to make it accessible to the TSDs at that site. This copy shall contain the data for all Public FCAs and all Shared and Private FCAs applicable for the site. When the central database is updated, the updates will be sent to the RRSVR process that is running on the fileservers at the remote sites. The RRHUB shall send heartbeat files to all RRSVR processes on a periodic basis so that the RRSVR processes can maintain synchronization with the RRHUB. In addition, the RRSVR process shall support a reconfigure command that will cause the RRSVR process to synchronize the data on FCAs contained in its local database with the central database.

When the TSD initializes, it shall request the FCA index from the RRSVR process at the local site (or other designated site). The RRSVR process shall then provide the TSD with the current data for the FCA index. The TSD shall request the RRSVR to send whatever FCA data it needs on a FCA-by-FCA basis. The RRSVR shall send the FCA data for each FCA requested back to the TSD using network addressing messages.

Whenever the RRSVR updates its database, it shall notify all TSDs at the local site (and other designated sites) of the change by sending the appropriate update or delete message.

For facilities that have multiple ETMS sites, such as ATCSCC and Volpe, the TSD shall be able to communicate with the RRSVR at any of the local sites. The specific site shall be defined in the */top_dir/tsd/config/comm_params* file. The reason behind this feature is to allow all TSDs at a facility to share FCAs in the site's FCA database.

2.0   Functional Description

2.1   Overview

The TSD shall provide an FEA/FCA option on the main TSD menu. The FCA option shall be located on the TSD main menu between the Reroute and Tools menu items. The TSD shall select the FCA menu when 'Alt C' is pressed with focus on the TSD display. The TSD shall provide the following options on this menu:

> Show/Hide FEA/FCAs
> Select FEA/FCA
> Create FEA/FCA
> Recall FEA/FCA
> Examine FEA/FCA   E
> Set FEA/FCA Defaults

In addition to these functions, the TSD shall provide Edit, Copy and Delete FEA/FCA functions that shall be accessible using the Select FEA/FCA dialog box. The TSD shall also provide an End Time Warning 30 minutes before the time when the FCA will end.

The following sections describe these functions in more detail.

2.2   Show/Hide FEA/FCA Function

Overview: The TSD shall provide a Show/Hide FEA/FCAs option on the FEA/FCA menu. This menu option shall toggle between "Show FEA/FCAs" and "Hide FEA/FCAs".

Menu Option: The TSD shall provide a Show/Hide option on the FEA/FCAs menu.

Quick Key: None

Functional Description

When the **Show** menu option is selected, the TSD shall show all FCAs that have their Show check boxes checked in the Select FEA/FCA dialog box. When FCAs are being shown, the TSD shall change this menu item to "Hide FEA/FCAs".

When the **Hide** menu option is selected, the TSD shall remove all FCAs from the TSD display. The "Show" status of FCAs in the Select FEA/FCAs dialog boxes shall remain unchanged when FCAs are hidden. When FCAs are being hidden, the TSD shall change this menu item to "Show FEA/FCAs".

When an FCA is being shown on the TSD display, the TSD shall periodically request data on the flights that are predicted to intersect the FCA.

2.3   Select FEA/FCA Function

Overview: The major purposes of the Select FEA/FCA function are to allow the user to specify which FCAs are to be shown on the TSD display and to allow the user to select an FCA to be edited or deleted.

When the Select FEA/FCA menu option is selected, the Select FEA/FCAs dialog box shall be displayed. This dialog box shall show the list of all FCAs that are contained in the database for the TSD workstation. This dialog box shall allow the user to specify which FCAs are to be shown on the TSD display. This dialog box also shall allow the user to select an FCA to be edited and to select multiple FCAs to be deleted.

Menu Option: The TSD shall provide a Select FEA/FCA option on the main FEA/FCA menu.

Functional Description

When the **FEA/FCA>Select FEA/FCA** menu option is selected, the TSD shall display the Select FEA/FCA dialog box. If no FCAs exist, the TSD shall gray out the menu option.

When the user presses either the OK or Apply buttons in the Select FEA/FCA dialog box, the TSD shall show FCAs. The TSD shall change the status of the Show/Hide FEA/FCAs menu option to "Hide FEA/FCAs" if it is in the "Show FEA/FCAs" state.

2.4   Examine FEA/FCA Function

Overview: A major purpose of the Examine FEA/FCA function is to allow the user to view information pertaining to the flights that are predicted to intersect the FCA. This function shall allow the user to view lists of these flights, view a demand chart that shows the number of flights that will intersect the FCA during each 15-minute period, and to view those flights on the TSD display.

When the Examine FEA/FCA menu option is selected, the Examine FEA/FCA dialog box shall be displayed. This dialog box shall allow the user to specify which FCA is to be examined.

Menu Option: The TSD shall provide an Examine FEA/FCA option on the main FEA/FCA menu.

Quick Key: 'E'

Functional Description

When the **FEA/FCA>Examine FEA/FCA** menu option is selected, the TSD shall display the Examine FEA/FCA dialog box. If no FCAs exist, the TSD shall gray out the menu option.

The TSD shall display the FEA/FCA Timeline dialog box when the 'E' quick key is pressed with an FCA being highlighted (browsed).

2.5   Create FEA/FCA Function

Overview: The Create FEA/FCA function shall allow the user to create a new FEA/FCA and designate the type of FCA. When this menu option is selected, the Create FEA/FCA dialog box shall be displayed. This dialog box shall allow the user to define the FCA, and specify the type of FCA (Private, Shared, or Public). The user shall also define the parameters of the flight filter that is part of the FCA definition and the list of ETMS sites that shall share the FCA definition.

Menu Option: The TSD shall provide a Create FEA/FCA option on the main FEA/FCA menu.

Quick Key: None

Functional Description

The TSD shall display the **Create FEA/FCA** dialog box when the **FEA/FCA>Create FEA/FCA** menu option is selected. The text entry fields in the Create FEA/FCA dialog box shall be filled in with the appropriate default values.

The Create FEA/FCA dialog box shall have four sections that can be accessed using tabs. The first tab shall provide text entry fields for entering the parameters that will define the FCA. The first tab shall also provide the action buttons to OK or Cancel the create FCA process. The second tab shall provide text entry fields for entering the parameters that define the filter for flights. The third tab shall provide fields for entering the sites that shall be designated for sharing the FCA. The fourth tab shall provide fields for entering the latitude and longitude of the points for a custom polygon.

This dialog box shall provide two options for defining the geometry of the FCA. The first option shall allow the user to define a custom polygon. The second option, which was new for Release 7.3, shall allow the user to define the FCA as a NAS element.

If the custom polygon option is selected, the TSD shall allow the user to define the custom polygon in one of three ways. The cursor may be used to draw a polygon on the TSD display by pointing and clicking. Alternatively for Release 7.5, the TSD shall allow the user to specify the latitude and longitude of the polygon points. Also for Release 7.5, the TSD shall allow the user to specify the center point and radius of a circle that defines the polygon. This polygon shall define the two-dimensional extent of the flow-constrained area. The Create FEA/FCA dialog box shall provide action buttons that will allow the user to erase the entire polygon or undo the last points that were specified.

For Release 7.3, the user shall be able to identify a NAS element as an alternative to defining a polygon.

When the user presses the OK button, the TSD shall validate the FCA definition. If the FCA is valid, the TSD shall assign the *FCA_id* and send an Update FCA message to the RRSVR process.

When the TSD receives a confirmation message that the FCA has been saved in the database, the TSD shall draw the FCA on the TSD display.

2.6   Save, Recall, and Delete FEA/FCA File Functions

Overview: In Release 7.3, the RRHUB shall automatically delete expired FCAs from the FCA database once a day. Therefore the TSD shall provide functions to allow the user to save, recall, and delete FCA files. It is expected that the FCA definitions will be saved to a common directory on a fileserver workstation so that they will be available from any workstation; however the user shall be able to designate the directory location for the FCA files. The Save FEA/FCA function shall allow the user to save an FCA definition to a designated directory. The Recall FEA/FCA function shall allow the user to recall an FCA definition from the designated directory, edit that definition, and then save the FCA in the distributed FCA database. The Delete FEA/FCA File function shall allow the user to delete FCA files from the designated storage location in the network file system.

Menu Option: The TSD shall provide a Recall FEA/FCA option on the main FEA/FCA menu. The TSD shall also provide Save, Recall, and Delete FEA/FCA File options on the File menu in the Select FEA/FCA dialog box.

Quick Key: None

Functional Description

The TSD shall display the **Recall FEA/FCA File** dialog box when the **Recall FEA/FCA** option is selected on the main FEA/FCA menu or on the File menu in the Select FEA/FCA dialog box. This dialog box shall allow the user to select the FCA file to be recalled. When the user selects the FCA file, the TSD shall display the Edit FEA/FCA dialog box with the parameters of the FCA being shown in the fields of the Edit FEA/FCA dialog box. The TSD shall change the values of the date parameters to be appropriate for the current date. (See Section 4.3.1.) The TSD shall recall the FEA/FCA as a Private FEA and the TSD shall change the name of the FEA to be the same as the filename. The user shall then be able to edit the FEA as desired. The TSD shall send the FCA definition to the RRSVR/RRHUB when the OK button is pressed in the Edit FEA/FCA dialog box. The TSD shall assign a unique fca_id, which denotes that it is a new FCA.

The TSD shall display the **Save FEA/FCA File** dialog box when the **Save FEA/FCA File** option is selected on the File menu in the Select FEA/FCA dialog box. To use this function, the user must first select an FCA in the Select FEA/FCA dialog box by clicking on the desired row. The Save FEA/FCA File dialog box shall show the current contents of the specified directory. The TSD shall display subdirectories as folders. The user may select an existing file to be overwritten or they may specify the name of a new file. When the OK button is clicked, the TSD shall save the FCA definition to the specified file.

The TSD shall display the Delete FEA/FCA Files dialog box when the Delete FEA/FCA Files option is selected on the File menu in the Select FEA/FCA dialog box. The user may select one or more files to be deleted.

2.7   Edit FEA/FCA Function

Overview: The Edit FEA/FCA function shall allow the user to edit an existing FEA/FCA definition. To use this function, the user must first select an FCA in the Select FEA/FCA dialog box by clicking on the desired row. When the FEA/FCA Functions>Edit FEA/FCA menu option

is selected, the Edit FEA/FCA dialog box shall be displayed. This dialog box will allow the user to modify the FCA definition and specify the domain of the FCA (Private, Shared, or Public).

Menu Option: The TSD shall provide an Edit FEA/FCA option in the FCA Functions menu in the Select FEA/FCA dialog box.

Quick Key: None

Functional Description

The TSD shall display the **Edit FEA/FCA** dialog box when the **FEA/FCA Functions>Edit FEA/FCA** menu option in the Select FEA/FCA dialog box is selected. The Edit FEA/FCA dialog box shall contain the definition of the selected FCA as it is defined in the FCA database. The user may then edit the FCA definition as desired.

If the FCA is defined as a custom polygon then while this dialog box is open, the TSD shall allow the cursor to be used to edit the drawing of the polygon on the TSD display by pointing and clicking. This polygon shall define the two-dimensional extent of the FCA. The Edit FEA/FCA dialog box shall provide action buttons that will allow the user to erase the entire polygon or undo individual points starting from the last points that were defined.

When the user presses the OK button, the TSD shall validate the FCA definition. If the FCA is valid, the TSD shall send an Update FCA message to the RRSVR process.

When the TSD receives a confirmation message that the FCA has been saved in the database, the TSD shall send a request for the flight data for that FCA and the TSD shall draw the FCA on the TSD display.

2.8   Delete FEA/FCA Function

Overview: The Delete FEA/FCAs function shall allow the user to delete one or more existing FCA definitions. To use this function, the user must first select one or more FCAs in the Select FEA/FCA dialog box by clicking on the desired row. The Select FEA/FCA dialog box shall provide a Delete FEA/FCA menu option. When this menu option is selected, the Delete Confirmation dialog box shall be displayed. This dialog box will allow the user OK or Cancel the delete function.

Menu Option: The TSD shall provide a Delete FEA/FCA option in FEA/FCA Functions menu in the Select FEA/FCA dialog box.

Quick Key: None

Functional Description

The TSD shall display the **Delete Confirmation** dialog box when the **Functions>Delete** menu option in the Select FEA/FCA dialog box is selected. To use this function, the user must first select one or more FCAs in the Select FEA/FCA dialog box by clicking on the desired row(s). If no FCA has been selected, the TSD shall display the Error dialog box.

When the Delete Confirmation dialog box is closed with OK, the TSD shall send a Delete FCA message to the RRSVR process, which will forward the message to the RRHUB process. If the RRHUB rejects the deletion request, the TSD shall display an error message. It the deletion request is accepted by the RRHUB, the TSD shall delete the FCA when the deletion message is received from the RRSVR.

2.9   Copy FEA/FCA Function

Overview: The Copy FEA/FCA function shall allow the user to copy an existing FCA definition. To use this function, the user must first select an FCA in the Select FEA/FCA dialog box by clicking on the desired row. When the Functions>Copy FEA/FCA menu option is selected, the Copy FEA/FCA dialog box shall be displayed with all of the FCA parameters shown except for the FCA Name. This dialog box will allow the user to modify the FCA definition and specify the name for the FCA. The major difference between the Create FEA/FCA and Copy FEA/FCA function, is that the Copy FEA/FCA function starts with all parameters already defined except the name. In both functions, the TSD shall assign a unique fca_id, which denotes that it is a new FCA.

Menu Option: The TSD shall provide a Copy menu option in the Select FEA/FCA dialog box.

Quick Key: None

Functional Description

The TSD shall display the **Copy FEA/FCA** dialog box when the **Functions>Copy** menu option in the Select FEA/FCA dialog box is selected. The Copy FEA/FCA dialog box shall contain the definition of the selected FCA as it is defined in the FCA database except that the FCA Name field shall be blank. The user may then edit the FCA definition as desired and specify the FCA Name.

When the FCA is defined as a custom polygon and this dialog box is opened, the TSD shall allow the cursor to be used to edit the drawing of the polygon on the TSD display by pointing and clicking. This polygon shall define the two-dimensional extent of the FCA. The Copy FEA/FCA dialog box shall provide action buttons that will allow the user to erase the entire polygon or undo individual points starting with the last points that were defined.

When the user presses the OK button, the TSD shall validate the FCA definition. If the FCA is valid, the TSD shall assign the unique fca_id and send an Update FCA message to the RRSVR process.

When the TSD receives a confirmation message that the FCA has been saved in the database, the TSD shall draw the FCA on the TSD display.

2.10   Set FEA/FCA Preferences

Overview: The TSD shall provide a Set FEA/FCA Preferences option on the FEA/FCA menu. The purpose of this function is to allow the user to set the default values for various other FCA functions.

Menu Option: The TSD shall provide a Set FEA/FCA Preferences option on the FCA menu.

Functional Description

When the **FEA/FCA>Set FEA/FCA Preferences** menu option is selected, the TSD shall display the Set FEA/FCA Preferences dialog box. This dialog box shall provide the user with the ability to specify their preferences for the default parameters for FCA functions including the default sites for sharing the FCA.

2.11   End Time Warning

For each FCA, the FCA definition includes a start and end date/time. The TSD shall alert the user 30 minutes before the designated "End Time" that the FCA will be ending in 30 minutes. The TSD shall provide this alert by displaying the FEA/FCA End Time Warning dialog box with the appropriate warning and by flashing the FCA that will be ending. The user may ignore the warning or they may edit the FCA to change the end time. The TSD shall <u>not</u> automatically remove the FCA from the database when the "End Time" occurs.

One issue is who should get the warning. The general answer is that the TSD should provide the warning to any user who can edit the FCA definition. Thus, the TSD shall implement the following rules to determine when to display the FEA/FCA End Time Warning dialog box.

1. If FCAs are not being shown on the TSD, the TSD not shall display the End Time Warning.

2. The TSD shall not display the warning for Public FCAs unless the TSD is allowed to edit Public FCAs.

3. When the display of FCAs is toggled ON, the TSD shall display the warning for any FCA that will expire within the next 30 minutes unless the rules stated above apply.

4. When a new FCA is added to the database or a FCA definition is changed in the database and FCAs are being shown on the TSD, the TSD shall display the warning for that FCA if it will expire within the next 30 minutes.

5. When the TSD displays a warning for a FCA that is not being shown, the TSD shall show the FCA.

2.12   Adaptation Functions

The TSD shall provide the standard adaptation functions for saving and recalling FCA functional parameters using the Display>Adapt menu option on the main TSD menu or the File menu on the FEA/FCA Preferences dialog box. The TSD shall also provide the standard adaptation functions on the File menu in the FEA/FCA Customize Columns dialog box for saving and recalling the Customize Columns settings.

The TSD shall save the following FCA functional parameters in adaptation files stored in the */top_dir/tsd/adapt/fca* directory. The values for the default parameters are listed in Table 2.1. These values shall be included in the */top_dir/tsd/adapt/fca/defaults* file. The TSD shall use these

default values as a fallback in the event that the *defaults* file is not available or does not define some of the parameters.

General FCA Adaptation Parameters	Default Value
Show/Hide FCAs status	Hide
Default FCA Duration (minutes)	300
Default Ceiling (100 ft)	600
Default Floor (100 ft)	0
Default Time Range for FCA Timeline (minutes)	360
Default Color for FCA Overlay	Green
Default Type of FCA	Private
Default FCA Status	Planned
Default workstation for FCA Files	null
Default selection for Custom Polygon or NAS Element	Custom Polygon
Default List of Sites for Shared FCA	None
Default Primary Sort Column	ACID
Default Primary Sort Order (Ascending or Descending)	Ascending
Default Secondary Sort Column	NONE
Default Secondary Sort Order	Ascending
Default Tertiary Sort Column	NONE
Default Tertiary Sort Order	Ascending

Table 2.1 Adaptation Parameters for FEA/FCA Functions

The TSD shall save the following FCA functional parameters in adaptation files stored in the */top_dir/tsd/adapt/fcalist* directory. The values for the default parameters are listed in Table 4.14. These values shall be included in the */top_dir/tsd/adapt/fcalist/defaults* file. The TSD shall use these default values as a fallback in the event that the *defaults* file is not available or does not define some of the parameters.

Adaptation Parameters for Each Column Option in the FEA/FCA Dynamic List Customize Columns Dialog Box
Data Item Name as it appears in the Customize Columns dialog box
Default Column Number or –1 if the option shall be listed in the "Available Options" list (i.e. column is not displayed)
Column Width

Table 2.2   Adaptation Parameters for Customize Columns function

2.13   FCA Flights Function

Overview: The FCA Flights function shall allow the user to see the flights that are predicted to contribute to the demand on an FCA in a specified time range. The TSD shall create and show a flight set that shows all of the flights that are predicted to traverse the FCA during the time range specified. All active flights in this flight set shall be shown using airplane flight icons. All flights in the flight set that have not yet departed shall be shown as small, empty circles at the airports where they will be originating. The Time Intervals selected in the FEA/FCA Timeline (see Section 4.8), shall be the time range that pertains to the FCA Flights function.

Menu command: A **Show/Hide Flights** menu option shall be provided in the **Function** menu of the FCA Timeline dialog box. This menu option shall toggle the display of flights for the FCA being examined.

Quick Key: '='   (With focus on an FEA/FCA Timeline dialog box.)

Command Line: None

Functional Description:

When the Show/Hide Flights menu option is selected in the FEA/FCA Timeline dialog box or the Flights toolbar button is clicked, the TSD shall toggle the FCA Flights function for the element being examined. The TSD shall toggle the FCA Flights function for the element when the '=' quick key is pressed if the Timeline dialog box has focus. If the FCA Flights function is ON for an element and the element ceases to be examined (both the Timeline and Bar Chart dialog boxes are closed), the TSD shall toggle the FCA Flights function OFF.

2.13.1 Toggle ON FCA Flights Function

When the FCA Flights function is toggled "ON" for the element, the TSD shall perform the following functions:

1. The TSD shall display the FCA Flights icon without the crossing lines in the Timeline dialog box. (The purpose of this icon is to indicate that FCA flights are being shown for the FCA.)

2. The TSD shall create a flight set that contains all of the active and inactive flights that are included in the file returned by the List Server. (Note that this flight set shall <u>not</u> be shown in the Flight Select dialog box and it shall not be shown in the Flight Count dialog box.) The TSD shall display the flight set using the color configured for the FCA Flights function by the Set FEA/FCA Defaults function.

3. The TSD shall toggle the Show/Hide Flights menu item to the Hide Flights state.

4. The TSD shall add the active visible FCA flights to the count of the total visible flights in the Flight Count dialog box. However flights shall not be double counted. That is if a flight is already visible for some other reason, it shall not be counted twice.

2.13.2 Toggle OFF FCA Flights Function

When the FCA Flight function is toggled "OFF" for the element, the TSD shall perform the following functions:

1. Remove the FCA flight set from the display.

2. Change the FCA Flights button in the Timeline toolbar to show crossing lines to indicate that FCA flights are not being shown for the FCA.

3. Toggle the Show/Hide Flights menu item to the Show Flights state.

4. Remove the active flights from the count of the total visible flights in the Flight Count dialog box.

2.13.3 Interaction with Flights Display

The display of flights using the FCA Flights function, Monitor Alert Examined Flights function, Find Flights function or the display of flights using the Select Flights function shall be independent of each other except that the color and type of flight icon shall be determined by the following priority order.

> Monitor Alert Examined Flights
> FCA Flights
> Select Flights
> Find Flights

That is if a flight would be displayed as a result of multiple functions, the Monitor Alert Examined Flights display option shall take precedence over the FCA Flights display option.

If a flight is being displayed only as the result of the FCA Flights function, the flight shall be drawn using the automatic icon in the color specified for the FEA/FCA.

If a flight is an FCA Flight for multiple FCAs whose flights are being shown, the TSD shall show the flight in the color of the FCA that is top most in the Select FEA/FCA dialog box when it is sorted according to the default sort order.

If a flight is both an FCA Flight and a member of a "shown" flight set (defined in Select Flights) and flights are ON, the TSD shall draw the flight using the airplane icon unless Select Flights has specified that it is to be drawn using the automatic icon. In the latter case, the TSD shall draw the flight using the automatic icon.

If a flight is both an FCA Flight and a "found" flight, the flight's datablock shall be turned on; however the color and icon type shall be defined as described above.

The Flights>Show/Hide menu option and the "F" quick key shall only affect the display of flights related to the Select Flights function. They shall not affect the display of any flights being displayed as a result of the FCA Flights function. If any flights are being displayed as a result of the Select Flights function when the FCA Flights function is invoked, those flights shall continue to be displayed. Those flights can be toggled off using the "F" quick key; however the flights being displayed as a result of the FCA Flights function shall not be toggled off with the "F" quick key.

2.14   Flight Count Algorithm

For Release 7.2, the count values that are to be displayed in the FEA/FCA Timeline and FEA/FCA Bar Chart shall represent the maximum number of flights that occupy the FCA during any 1-minute interval within a 15-minute period. For Release 7.3, the user shall have the option of specifying whether the counts represent the maximum occupancy during any 1-minute interval or whether the counts represent the total number of flights that enter the FCA during the 15-minute period.

This section describes the algorithms for calculating the peak occupancy counts and the total counts.

The TSD shall determine the FCA peak occupancy counts that shall be displayed in the FEA/FCA Timeline and FEA/FCA Chart dialog boxes. Unlike the Monitor Alert functions where the TDB determines the peak occupancy counts, the TSD will need to calculate these counts based upon the FCA entry and exit times for each flight. These times are contained in the FCA Flights file that the TSD receives from the FCATA. This section describes the algorithm that the TSD shall use to determine these counts for each FCA.

The TSD shall use the following algorithm for determining the peak occupancy counts that the TSD shall show in the FEA/FCA Timeline and FEA/FCA Bar Chart. The TSD shall make this determination when it receives the FCA Flights file from the FCATA.

1. For all flights that are contained in the FCA Flights file, determine the date/time period that the each flight will occupy the FCA. The TSD shall make this determination using the flight's FCA entry and exit times that are specified in the FCA Flights file. [Note to developer: The date may not be specified and may have to be deduced from the time values.]

2. For each 1-minute time interval from the FCA start date/time to the FCA end date/time, determine the number of active flights, proposed flights, and total flights that are predicted to occupy the FCA during that 1-minute interval. A flight shall be considered to occupy the FCA during the 1-minute interval if the following conditions are true:

> Flight Entry Time $\leq$ Interval Time
> AND
> Flight Exit Time $\geq$ Interval Time

Where: Interval Time = Time at the beginning of the 1-minute interval

[Note to developer: We need to verify that the FCATA uses compatible logic.]

3. For each 15-minute time period from the FCA start date/time to the FCA end date/time, determine the 1-minute time interval within the 15-minute period that has the maximum number of total flights (active + proposed) that are predicted to occupy the FCA during that 1-minute time interval. In the event that multiple 1-minute intervals have the same maximum number of total flights, the first 1-minute interval that has the most active flights shall be the 1-minute interval for determining the peak occupancy counts. The peak occupancy counts for the 15-minute time period shall be the number of active and proposed flights for that 1-minute interval.

Each 15-minute time period shall start on the hour or 15, 30, or 45 minutes past the hour as appropriate. (This is similar to Monitor Alert time intervals.)

If the user has selected the Total Flights counts for the FEA/FCA Timeline and Bar Chart, the TSD shall determine the total number of flights that are in the FCA during the 15-minute interval. This total number shall include all flights that are in the FEA/FCA at the beginning of the interval plus the number of flights that enter the FEA/FCA during the interval. In this case the Bar Chart shall show the breakdown between flights that are currently active and those that are proposed.

3.0 Data Interfaces

3.1 Introduction

The TSD shall interface with the RRSVR, RRHUB, and LSTNET processes using ETMS Network Addressing.

When a specialist creates, edits, or deletes a FCA, the TSD shall send a message to the RRSVR process on the local fileserver. Section 3.3 describes the messages that the TSD shall send to the RRSVR and RRHUB processes.

The FCA Database Server (RRSVR) shall maintain the FCA database that the TSD will access via queries to the RRSVR process. When the RRSVR updates the FCA database, the RRSVR shall notify all of the TSDs on its site and other designated sites. The TSD shall send request messages to the RRSVR process to obtain the information needed to update the data for particular FCAs.

See the Software Requirements document for the FCA Database Functions for a description of the format of the FCA database files.

3.2 FCA Database Interface

3.2.1 TSD Initialization

When the TSD initializes, it shall send a message to the RRSVR process at site designated in the TSD *comm_params* file. This message shall request the FCA index data. The */top_dir/tsd/config/comm_params* file shall specify the site of the RRSVR process as shown below. This specification shall be included in the *comm_params* file following the specification of the Tertiary Site.

> # RRSVR SERVER SITE
>   rrsvr_sitename = <sitename>

If the site is defined as "local", the TSD shall send the message to the RRSVR process on its site. However, the TSD shall be able to communicate with an RRSVR process on another site if that site is specified in the *comm_params* file. This requirement is necessary to support a facility (such as ATCSCC and Volpe) that has multiple ETMS sites so that all TSD users at the facility will be able to share a common database of Shared FCAs. [However remote sites shall not be allowed since the TSD must be able to read files that are stored on the RRSVR node.]

When the RRSVR receives the message requesting the FCA index data, the RRSVR shall send back a message to the TSD that contains the pathname of a file containing the current FCA index data. When the TSD receives this message, it shall read the FCA Index file and the TSD shall compare the index data with the FCA data that is currently in the TSD's internal data structures. (At first during initialization, the TSD will not have any FCA data.) The TSD shall determine what FCA data it needs. In particular, the TSD shall acquire the data for all Public FCAs, all Shared FCAs in the RRSVR database, and all Private FCAs for the TSD node.

There are two ways the TSD can acquire the FCA data. The TSD can read the FCA data files from the RRSVR database or the TSD can request the data for each FCA that it needs one-by-one. The first method is faster and is preferred at least during initialization in order to minimize the initialization time. However there are some drawbacks to this method, which are eliminated by the second method. The major drawback is that it may be possible for the TSD to read an FCA file prematurely before the RRSVR has completely written the file to the disk. Therefore the recommended implementation scheme is that during initialization, the TSD shall read the FCA data files from the RRSVR database. In the event that the TSD detects that an FCA file is incomplete or there are other problems in reading the file, the TSD shall request the data for that FCA by sending an FCA Data Request message. During normal operation, the TSD shall send a FCA Data Request message for each FCA. Note that the TSD shall contain, in its internal data structures, the data for all Public and Shared FCAs as well as the data for all of the Private FCAs that were created on the TSD's workstation.

To read the FCA data file from the RRSVR node, the TSD shall perform the following steps:

1. Obtain the full pathname of the FCA data file to be read from the FCA Index file.

2. When the TSD reads an FCA data file, the TSD shall determine if the data file was properly read by validating that the last character in the file is the correct terminator character.

3. For any data files that the TSD is unable to read properly, the TSD shall send an FCA Data Request to the RRSVR for the FCA data.

3.2.2 Ignoring Messages from Undesignated RRSVR Processes

Under certain circumstances, it may be desired to configure a particular TSD on a site in such a way that it interacts with an RRSVR process on a site that is different from the RRSVR process that is used by other TSDs on that site. (This circumstance is likely to be needed during system testing.) Thus the TSD shall ignore all messages that are received from an RRSVR process on a site that is different from the site specified for the RRSVR process in the comm_params file. Note that the TSD should accept all messages from an RRHUB process regardless of its site.

3.2.3 Processing for FCA Heartbeat or FCA Index Messages

On a periodic basis, the RRSVR shall send FCA Heartbeat Messages to the TSD. The TSD will receive an FCA Index Message whenever it requests the index, which is typically done during initialization. Both of these messages shall contain the pathname of a file that contains the FCA Index. This file shall be a copy of the current *fca_index* file.

The TSD shall perform the following functions when an FCA Heartbeat or FCA Index Message is received:

1. The TSD shall read the FCA Index file whose pathname is contained in the FCA Heartbeat or FCA Index Message from the RRSVR.

2. For all Public and Shared FCAs, the TSD shall identify all *fca_id* values that are not contained in its internal data structures. The TSD shall then send a FCA Data Request message to the RRSVR for each of those FCAs.

3. For all Private FCAs, the TSD shall identify all *fca_id* values that are not contained in its internal data structures where the *update workstation* equals the value of the TSD *workstation*. (Note the TSD only needs Private FCAs that were created on its node.) The TSD shall then send a FCA Data Request message to the RRSVR for each of those FCAs.

4. For all Public and Shared FCAs, the TSD shall identify all FCAs for which it has obsolete data. The TSD shall determine that a FCA's data is obsolete by identifying all *fca_id* values that are contained in its internal data structures and that have an *update_date_time* value that is later than its internal value. The TSD shall then send a FCA Data Request message to the RRSVR for each of those FCAs.

5. For all Private FCAs, the TSD shall identify all FCAs for which it has obsolete data. The TSD shall determine that a FCA's data is obsolete by identifying all *fca_id* values that are contained in its internal data structures and that have an *update workstation* value that equals the value of the TSD *workstation* and that have an *update_date_time* value that is later than its internal value. The TSD shall then send a FCA Data Request message to the RRSVR for each of those FCAs.

6. For all types of FCAs, the TSD shall identify all FCAs that should be deleted from its internal data structure. These shall be FCAs that have *fca_id* values that are contained in its internal data structure but are not contained in the index message AND that have an update_date_time value that is at least five minutes before the last_update time specified in the index header. The TSD shall delete all of those FCAs from its internal data structures; however that TSD shall not delete any FCA that has been temporarily added to Select FCAs (see Section 4.3.2). When an FCA is deleted, the TSD shall stop requesting flight data for that FCA.

3.2.4 Processing for FCA Update Messages

Whenever the RRSVR updates the FCA database, the RRSVR shall notify all TSDs on its site and other designated sites of the update by sending FCA Update or FCA Delete messages as appropriate.

When the TSD receives an "UPDATE" message, the TSD shall determine if the update is for a new FCA or is a modification of a FCA that is already contained in its internal data structures.

When the TSD receives an "UPDATE" message with data for a new FCA, it shall perform the following functions:

1. The TSD shall update the Select FCA dialog box to add the new FCA. The "Show" check box shall be selected.

2. If the TSD is showing FCAs, the TSD shall draw the new FCA on the display.

3. If the TSD is showing FCAs, the TSD shall request flight data for this new FCA.

When the TSD receives an "UPDATE" message with the data for a modified FCA, it shall perform the following functions:

1. The TSD shall update the Select FCA dialog box as necessary for the modified FCA.

2. If the TSD is showing the modified FCA, the TSD shall request flight data for this FCA.

3.2.5 Processing for FCA Delete Messages

Whenever the RRSVR deletes an FCA in the FCA database, the RRSVR shall notify all TSDs on its site and other designated sites of the update by sending an FCA Delete message.

When the TSD receives a "DELETE" message, it shall perform the following functions:

1. The TSD shall delete the FCA from its internal data structures, update the Select FCAs dialog box to remove the FCA, remove the FCA from the display, and close the FCA Timeline dialog box if the FCA is being examined.

3.3   Database Messages Sent and Received by the TSD

The TSD shall send messages to the ETMS Reroute/FCA Database Server (RRSVR) process to execute the FCA database functions. The RRSVR shall respond to these messages with a valid response or either a confirmation or an error message. The TSD shall receive heartbeat messages from the RRSVR on a periodic basis (typically every five minutes) that contain the current data for the FCA index. The TSD shall also receive update and delete messages from the RRSVR whenever the RRSVR has updated its database. Appendix A defines the message types that the TSD shall use for each database function.

The ETMS constants for these message types are:

NWA_FCA_HEARTBEAT	= net$_min_allowed_user_msg + 1816
NWA_FCA_UPDATE	= net$_min_allowed_user_msg + 1817
NWA_FCA_DELETE	= net$_min_allowed_user_msg + 1818
NWA_FCA_REQUEST_INDEX_ID	= net$_min_allowed_user_msg + 1819
NWA_FCA_REQUEST_DATA_ID	= net$_min_allowed_user_msg + 1820
NWA_FCA_INDEX_ID	= net$_min_allowed_user_msg + 1821
NWA_FCA_UPDATE_ID	= net$_min_allowed_user_msg + 1822
NWA_FCA_DELETE_ID	= net$_min_allowed_user_msg + 1823
NWA_FCA_CONFIRM_ID	= net$_min_allowed_user_msg + 1824
NWA_FCA_ERROR_ID	= net$_min_allowed_user_msg + 1825

Note: The value of net$_min_allowed_user_msg is usually 1001.

The syntax for these messages is described in the following sections.

Notes:
1. The special character '%' shall separate each field. Individual parameters within each field shall be separated by a space. Blank fields shall be indicated by a single space.

2. Messages shall contain all fields. However fields may have a single space to indicate that there are no parameters defined for this field. All fields shall have either a value or a single space.
3. Mutually exclusive command parameters are listed within [] brackets.
4. Mandatory character strings are listed within {} brackets.
5. The text must be capitalized.
6. A three numeric character unique message ID shall be assigned by the sender and placed at the beginning of the message. Only the TSD needs these unique message IDs thus the RRHUB and RRSVR can use any 3 numeric characters for messages that they originate.
7. The TSD shall assign the Unique Message ID and it shall use this ID to match up the response with the request. Appendix B lists the reply messages that shall be returned by the RRSVR or RRHUB for each of the message types sent by the TSD.

3.3.1 FCA Update Message

The TSD, RRSVR, and RRHUB processes shall use the FCA Update Message to request that the recipient process update its database by creating a new FCA or editing an existing FCA. There shall be two forms of the FCA Update Message. One for FCAs that are defined as custom polygons and the other for FCAs that are defined as NAS elements. The first portion of the message shall be the same for both types of FCAs. The second portion shall depend on the FCA type.

The following is a description of the FCA Update message for an FCA that is defined as a custom polygon:

{**UPDATE**} <Sender Address> <FCA_ID> <FCA Name> <FCA Type> <Sites for sharing FCA> <Update Date/Time> <Update Workstation> <Update Site> <Creation Workstation> <Creation Site> <FCA Status> <Color Index> <Start Date/Time> <End Date/Time> <Multiple fields for the Flight Filter parameters> <NAS Element Type> <Ceiling> <Floor> <Direction> <Speed> <FCA Drawing Flag> <Circle Center Point> <Circle Radius> <Polygon Points>

The following is a description of the FCA Update message for an FCA that is defined as a NAS element:

{**UPDATE**} <Sender Address> <FCA_ID> <FCA Name> <FCA Type> <Sites for sharing FCA> <Update Date/Time> <Update Workstation> <Update Site> <Creation Workstation> <Creation Site> <FCA Status> <Color Index> <Start Date/Time> <End Date/Time> <Multiple fields for the Flight Filter parameters> <NAS Element Type> <NAS Element>

The following table describes the fields that are common to both types of FCA Update messages:

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"UPDATE"	6 char
Sender Address:	Numeric NWA address of the sending process. (nnnn.nnnn.nnnn.nnnn.nnnn)	24 char
FCA_ID:	Unique Identifier of the FCA. {fca}{.}<site>{.}<creator workstation>{.}<creation date/time (yyyymmddhhmmss)>	60 char
FCA Name:	Name of the FCA	30 char
FCA Domain:	PRIVATE or SHARED or PUBLIC	7 char
Sites for sharing the FCA	List of ETMS sites that shall share the FCA.	Variable
Update Date/Time:	Date time stamp when the FCA was last updated (yyyymmddhhmmss)	14 char
Update Workstation:	ASCII name of the workstation that is creating or editing the FCA (e.g. WKSTN03)	32 char
Update Site:	ASCII Name of the site of the TSD that is creating or editing the FCA (e.g. ZBW) (This is the site of the TSD that last edited the FCA.)	8 char
Creation Workstation:	ASCII name of the workstation that created the FCA (e.g. WKSTN03) (This is the same as the 'workstation' field in the fca_id.	32 char
Creation Site	ASCII Name of the site of the TSD that created the FCA. (This is the same as the 'site' field in the fca_id.	8 char
FCA Type:	FEA or FCA	7 char
Color Index:	Index Value for the color (0-35)	2 char
Start Date/Time:	Date and time of the start of the FCA (yyyymmddhhmmss)	14 char

Field	Description	Max Length
End Date/Time:	Date and time of the end of the FCA (yyyymmddhhmm)	12 char
Departure Filter	Boolean logic for filtering flights that depart from the specified Airports or ARTCCs.	67
Arrival Filter	Boolean logic for filtering flights that arrive at the specified Airports or ARTCCs.	67
Traversal Filter	Boolean logic for filtering flights that traverse the specified ARTCCs, Sectors, or Fixes.	67
Airway Filter	Boolean logic for filtering flights that use the specified airway within the FCA.	67
Located In Filter	Boolean logic for filtering flights that are located in the specified Sectors or ARTCCs.	67
Aircraft Type Filter	Boolean logic for filtering flights that are the specified type of aircraft.	67
Remarks Filter	Boolean logic for filtering flights that have the specified Remarks.	67
Heading Filter	Boolean logic for filtering flights that have the specified heading $\pm$ heading range upon entry into the FCA. The units shall be degrees. (e.g hhh rrr where hhh = Heading and rrr = Range)	7
ACID Filter	Boolean logic for filtering flights whose ACID begins with the specified ACIDs.	67
Flight Level Filter	Parameters for filtering flights whose flight levels in the FCA are within the specified range. If the Upper Level = 600 and the Lower Level = 0, then the TSD shall send an empty field in the FCA Update message to indicate that no filtering is to be performed for this field. When the TSD receives an FCA Update message with an empty field, the TSD shall insert 600 and 000 into the Upper and Lower flight level fields. (e.g. UUU LLL where UUU=Upper and LLL=Lower in hundreds of feet.)	7
Aircraft Category Filter	Parameters for filtering flights whose aircraft category is one of the specified types. (J, P, T)	5

Field	Description	Max Length
Aircraft Weight Class Filter	Parameters for filtering flights whose weight class is one of the specified types. (H, L, S)	5
Aircraft User Category Filter	Parameters for filtering flights whose aircraft user category is one of the specified types. (T=Air Taxi, F=Cargo, C=Commercial, G=General Aviation, M=Military)	9
Active/Proposed Filter	Parameters for filtering flights whose status is active and/or proposed. (A=Active, P=Proposed) This field shall be empty if the 'All' option is selected.	1
Time Range Filter	Parameters for filtering flights by departure or arrival time period. (D=Depart, A=Arrival) (e.g. D hhmm hhmm) This field shall be empty if the 'No Filter' option is selected.	11
NAS Category	Type of NAS Element (SECTOR, FIX, TRACON, SUA, AP_ARR, AP_DEP, POLYGON, CIRCLE) 'POLYGON' shall indicate that the FCA is a custom polygon.	8 char

The following table describes the fields for the second portion of the FCA Update message for FCAs that are defined as custom polygons.

Field	Description	Max Length
Ceiling:	Upper altitude (100 ft)	3 char
Floor:	Lower altitude (100 ft)	3 char
Direction:	Direction of movement (0-359 degrees)	3 char
Speed:	Speed of movement (knots)	3 char
FCA Drawing Flag:	0 = FCA Drawn at current time 1 = FCA Drawn at start time	1 char
Circle Center Point	Center point of the circle in NAS format: N Latitude/W Longitude (ddmmN/dddmmW)	12
Circle Radius	Radius of the circle in nautical miles	3
Polygon Points	Character string of the points that define the polygon. A single space shall separate each point. Each point shall be defined in hundredths of degrees in the format: lat/long. e.g 6789,12345 is 67.89°N and 123.45°W	832

The following table describes the field for the second portion of the FCA Update message for FCAs that are defined as NAS elements.

Field	Description	Max Length
NAS Element:	Character string of the Name of the NAS element that defines the FCA	64 char

The following are rules related to the contents of the fields that make up the flight filter parameters:

1. An empty field for a Flight Filter parameter denotes that no filtering is required for that parameter.

2. The fields that contain Boolean logic for filtering flights shall have the following format:

    !(*user entered string*)

    where the "!" denotes the logical NOT. If the user has selected the inclusion option ('do' or 'are'), this character shall not be present in the field. The user-entered text shall be enclosed within parenthesis.

3. Individual items within each field that are separated by a space shall be considered to be joined by a logical 'OR'.

3.3.2   FCA Delete Message

The TSD, RRSVR, and RRHUB processes shall use the FCA Delete Message to request that the recipient process update its database by deleting existing FCAs. Starting with Release 7.3, the RRHUB shall delete multiple FCAs with one FCA Delete message. The TSD shall restrict the maximum number of FCAs to be deleted with one message to 100.

The following is a description of the syntax conventions for this request message:

    {**DELETE**}   <sender address> <FCA_ids>

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"DELETE"	6 char
Sender Address	Numeric NWA address of the sending process. (nnnn.nnnn.nnnn.nnnn.nnnn)	24 char

FCA_IDs	Unique Identifiers of the FCAs to be deleted. A space shall separate each identifier. {fca}{.}<site>{.}<creator workstation> {.}<creation date/time (yyyymmddhhmmss)>	Variable

3.3.3 FCA Index Message

The RRSVR processes shall be use the FCA Index Message to notify the TSD processes that the database has been updated. The RRSVR shall make a uniquely named copy of the current *fca_index* file and store this file in the */etms_data/rrsvr* directory on the RRSVR node. The pathname of this file shall be included in the FCA Index Message.

The following is a description of the syntax convention for this message:

{**INDEX**}   <Pathname of the copy of the *fca_index* file>

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"INDEX"	5 char
Pathname of the fca_index file:	Pathname of a copy of the fca_index file. e.g. /nfs/wkstn01/etms_data/rrsvr/fca_index.yymmddhhmmss	Variable

3.3.4 FCA Data Request

The TSD or RRSVR processes shall send a FCA Data Request message to the RRSVR (or RRHUB) process to request the data for a specific FCA. When the RRSVR (or RRHUB) process receives the message, it shall respond with either an UPDATE message or an ERROR message as appropriate.

The following is a description of the syntax convention for this message:

{**REQDATA**}   <sender address> <FCA_id>

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"REQDATA"	7 char
Sender Address	Numeric NWA address of the sending process. (nnnn.nnnn.nnnn.nnnn.nnnn)	24 char

FCA_ID	Unique Identifier of the FCA. {fca}{.}<site>{.}<creator workstation> {.}<creation date/time (yyyymmddhhmmss)>	60 char

3.3.5   FCA Index Request

The TSD or RRSVR processes shall send a FCA Index Request message to the RRSVR (or RRHUB) process to request the index data for the FCA database. When the RRSVR (or RRHUB) process receives the message, it shall respond with either a FCA Index message or an ERROR message as appropriate.

The following is a description of the syntax convention for this message:

{**REQINDEX**}   <sender address>

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"REQINDEX"	8 char
Sender Address	Numeric NWA address of the sending process. (nnnn.nnnn.nnnn.nnnn.nnnn)	24 char

3.3.6   Error Message

The RRSVR or RRHUB processes shall send an Error Message when they encounter an error condition.

The following is a description of the syntax convention for this message:

{**Message Keyword**}   <FCA_ID> <Text of error message>

Field	Description	Max Length
Unique Message ID	Message ID to allow TSD to match the response to the message that was sent.	3 char plus space
Message Keyword:	"INDEX_ERROR" "DATA_ERROR" "UPDATE_ERROR" "DELETE_ERROR"	12 char

FCA_ID	Unique identifier of the FCA that is provided in the request message. For Index Request messages that do not contain a FCA_id value, a character string of "0000" shall be returned.	32
Error Message	Text of error message that begins with "-E". (Null terminated string.)	256

3.3.7 Confirmation Message

The RRSVR or RRHUB processes shall send the TSD a Confirmation Message when appropriate. See Reference 2, Section 7.0 for a description of the syntax of the confirmation message.

3.4 FCA Flight Data

The TSD shall request data for FCA flights on a periodic basis for all FCAs that are being shown on the TSD display. The TSD shall make this request to the FCA Traffic Analyzer (FCATA). The FCATA shall return a file that contains data for all flights that are predicted to intersect the FCA. The format for this file is described in Appendix C. Included in the data for each flight is the predicted FCA entry and exit times for the flight. The TSD shall use this entry and exit times to determine the flight counts in each 15-minute interval. (See Section 2.14) These counts shall be displayed in the FCA Timeline and FCA Bar Chart dialog boxes. [Note that this is similar to the process that is used by the TSD for Monitor Alert Examined Flights data.]

The following are the message types that the TSD shall send to and receive from the FCATA for the FCA flight data:

Description	TSD Message Type	ETMS Message Type
Flight Data Request	FCA_FLIGHT_DATA_REQUEST_ID	NWA_FCATA_REQUEST_ID
FCATA Error	FCA_FLIGHT_DATA_ERROR_ID	NWA_ERR_REQUEST_ID

The ETMS constants for these message types are:

NWA_FCATA_REQUEST_ID = net$_min_allowed_user_msg + 1830
NWA_ERR_REQUEST_ID = net$_min_allowed_user_msg + 106

If an error message is received from ETMS in response to the request, the TSD shall log the error message in the TSD trace file.

The TSD shall send a Flight List Request to the ETMS FCATA process whenever the FCA Timeline is being shown. The TSD shall send these requests periodically with the frequency that shall be specified in the TSD *comm_params* configuration file. (The thinking is that the FCATA will cache the data files so that it doesn't have to generate the same data file if multiple TSD's are examining the same FCA.)

The following is a description of the message that the TSD shall send to the FCATA:

The following is the Flight List request syntax to be sent to the FCATA:

<Unique Message ID> <FCA ID> <start time> <end time> <pathname for the returned file>

Notes:
1. One space shall be used as a delimiter between parameters.
2. The TSD shall assign a unique message ID (001 to 999) and it shall use this ID to match the response to the request.
3. The file shall be returned to the */etms_data/alerts* directory.
4. The file name shall be constructed as follows:

   fca_<fca name>.mmddhhmmss

5. The TSD shall delete the file after it is read.
6. The Start and End Times shall be in UNIX time (seconds since June 1, 1970)

Appendix C provides a description of the format and contents of this file.

3.5 List Requests

The TSD shall send requests to the List Server (LSTNET) for List Reports. The TSD shall allow the user to enter List Requests in the TSD Command Line or the user may request an FCA Report in the FCA Timeline dialog box. Either of these methods shall result in the TSD sending a list request to the List Server. The TSD shall make this request to the LSTNET process (List Server) using the FCATA and LIST keywords. The FCATA keyword shall cause the List Server to get flight data from the FCATA and the FTM. The LIST keyword shall cause the List Server to construct a list report based upon the specifications included in the list request and to return the report to the TSD in the *reports* directory.

The following are the message types that the TSD shall send to and receive from the List Server for the FCA flight data:

Description	TSD Message Type	ETMS Message Type
List Request	LIST_REQUEST	NWA_LIST_REQ
List Reply	LIST_REPLY	NWA_LIST_REPLY

The ETMS constant for this message type is:

    NWA_LIST_REQ   = net$_min_allowed_user_msg + 300   = 1301
    NWA_LIST_REPLY   = net$_min_allowed_user_msg + 301   = 1302

If an error message is received from ETMS in response to the request, the TSD shall log the error message in the TSD trace file.

The following is a description of the REQ message that the TSD shall send to the List Server:

The following is the List request syntax that the TSD shall send to the List Server by the Command Line function:

    {**REQ**} {**FCATA**}<FCA Name>
        (time period) (filters) (every) {**LIST**} (columns) (sort)

Notes:

1. One space shall be used as a delimiter between parameters.
2. Mandatory character strings are listed within { } brackets.
3. Optional parameters are listed in ( ) brackets.
4. The text of the message sent to the List Server shall begin with the command key words "REQ" and "FCATA"

The following is a description of the elements contained in the message portion of this request message:

Keywords:	"REQ" and "FCATA"
FCA Name:	This is the name of the FCA for which the list report is being requested.
Time Period:	The optional *time period* parameter may be included in the request. The List Server shall accept any of the standard formats for the time period as defined in the ETMS Reference Manual, Appendix A. By default the report shall cover the time period of five hours beginning at the current day and time.
Filters:	The optional *filter* parameters may be included in the request. The List Server shall accept any of the standard filter specifications as defined in the ETMS Reference Manual, Appendix A.
Every:	The optional *every* parameter may be included in the request. (This parameter allows the user to change the time interval into which flights are grouped and counted in the report.)
Keyword:	"LIST"
Columns:	The optional *columns* parameters may be included in the request. (This parameter allows the user to change the columns of information and the order that they will appear in the report.) The List Server shall accept any of the column specifications that are defined in the ETMS Reference Manual, Table of List Report Column and Sort Options.
Sort:	The optional *sort* parameters may be included in the request. (This parameter allows the user to change the sort order for the list report.) The List Server shall accept any of the sort specifications that are defined in the ETMS Reference Manual, Table of List Report Column and Sort Options.

The List Server shall also accept Request Scripts in the REQ command. The name of the Request Script shall be at the end of the REQ command. Otherwise the Request Script feature for FCA list reports shall follow the same rules as all other Request Script commands as described in Appendix A of the ETMS Reference Manual.

3.6   FCA Index File Format

For the format of the FCA Index File, see the Software Requirements document for the FCA Database Functions.

4.0   User Interface

The following sections describe the user interface elements of the FCAs functions.

4.1   FEA/FCA Menu Options

The TSD shall provide a FEA/FCA option on the main TSD menu. The TSD shall provide the following options on this menu and sub-menus:

      Show/Hide FEA/FCAs
      Select FEA/FCA
      Examine FEA/FCA
      Create FEA/FCA
      Recall FEA/FCA
      Set FEA/FCA Defaults

The Show FEA/FCAs, Examine FEA/FCA, and Select FEA/FCA shall be grayed out if there are no FCAs to be displayed.

4.2   Select FEA/FCA Dialog Box

The TSD shall display the Select FEA/FCA dialog box when the **FEA/FCA>Select FEA/FCA** menu option is selected. This dialog box, which is shown in Figure 4.2.1, will be the primary user interface for defining which FCAs are to be displayed by the TSD.

Each row in the dialog box shall define one FCA. As a default, the TSD shall sort the FCAs by Domain then by name. However the TSD shall also allow the user to sort the FCAs by clicking on the column headers for Domain, Type, Name, or Facility. When the FCAs are sorted by Domain, they shall be sorted in the following order: Public, Shared, Private and then in ascending alphabetical order by name. (i.e. Public FCAs shall be on top.) When the FCAs are sorted by Type, they shall be sorted in the following order: FCA, FEA, Expired and then in ascending alphabetical order by name. When the FCAs are sorted by Facility, they shall be sorted in ascending alphabetical order by facility and then by name.

Figure 4.2.1   Select FEA/FCA Dialog Box

Unlike the Select Flights dialog box, the only active fields in the Select FEA/FCAs dialog box shall be the Show checkbox, the Color button, and the Info button. (To edit or change other fields, the user shall be required to select the FCA and then select the Edit menu option.)

The **FEA/FCA Name** field shall be sized to display at least 16 "W" characters. (The name could be as long as 30 characters.) It shall scroll horizontally if needed to display additional characters. Since this field shall not be editable, the TSD shall provide a means for the user to scroll the field. [Alternatively, the height of the field can be expanded to display the entire Name.]

The **Facility** field shall contain the name of the ETMS site where the FCA was created. [Creation Site in the database.]

When a **Color** button is pressed, the TSD shall display the Color Palette dialog box. When a color button is pressed in the Color Palette, the TSD shall change the color button in the Select FEA/FCAs dialog box to reflect the selected color. However this change shall not affect the color that is associated with the FCA in the database.

The following table describes the buttons that shall be provided to select display options for each FCA:

Button	Specification
Show	The Show button shall be a check-box that when activated will designate that the FCA is to be displayed.
Color	The Color button shall display a color palette dialog box that will allow the user to select the color that will be used to display the FCA. The selected color shall be displayed in the button. The TSD shall not update the FCA database with the changed color. (This feature will allow users to change the color of the FCA on the TSD display without affecting other users.)
Info	The Info button shall display the FEA/FCA Information dialog box. This dialog box shows information about the FCA.

When the Select FEA/FCAs dialog box is opened, focus shall be on the *Show* button of the first FCA. The **<TAB>** and **<Shift TAB>** keys shall cause the focus to move from one active field or button to the next. Each action button (OK, Apply, Cancel, and Help) shall also be a tab group so that when the **<TAB>** key is pressed when focus is on the *Info* button of the last FCA, the focus shall move to the OK action button. When the **<Tab>** key is subsequently pressed, keyboard focus shall move to the Apply, Cancel, and Help buttons, in that order. If the **<Tab>** key is pressed when focus is on the Help button, focus shall move to the *Show* button of the first FCA.

When the **OK** button is clicked, the TSD shall update the display to show the FCAs that have their *Show* check button selected and the TSD shall close the dialog box. Each FCA shall be shown using the color that has been selected for the FCA. If FCAs are being hidden when the **OK** button is clicked, the TSD shall toggle on the display of FCAs. The FCAs Show/Hide menu option shall be changed to reflect the correct display status.

When the **Apply** button is clicked, the TSD shall perform the same functions as with the **OK** button except that the dialog box shall not be closed.

When the **Cancel** button is clicked, the TSD shall close the dialog box and discard any changes to the FCA definitions that have been made since the dialog box was opened or since the **Apply**

button was clicked, which ever occurred last. The TSD shall update the display if necessary to reflect the resulting FCA definitions after any changes are discarded.

When the **Help** button is clicked, the TSD shall display the help window showing the help text for the Select FEA/FCAs dialog box.

The Select FEA/FCAs dialog box shall support the following basic features:

- Vertical resizing from a minimum of one FCA to a maximum of all FCAs or the screen size whichever is less. When the dialog box is resized vertically, only whole rows shall be shown. The TSD shall display a scroll bar if not all FCAs are visible in the dialog box.
- The TSD shall allow the user to select only one row to be edited or copied. If the user has selected more than one row, the Edit and Copy menu options shall be disabled.
- The TSD shall allow the user to select more than one row to be deleted.

The **File** menu on the Select FEA/FCAs dialog box shall have three options:

Recall FEA/FCA File…
Save FEA/FCA File…
Delete FEA/FCA Files…

The Save and Recall options shall allow the user to save an FCA definition as a file in a user specified directory and to recall it later. Users sometimes have FCAs that they use over an over again. However since expired FCAs will now be deleted from the RRHUB FCA Database once a day, it will be necessary for the users to be able to save and recall the FCA definitions that they wish to reuse. The Delete option shall allow users to delete FCAs that had been saved previously. See Section 4.3 for a description of these functions.

The **Functions** menu on the Select FEA/FCAs dialog box shall have four options:

Edit
Delete
Copy
Examine
Sort by   >>   Domain
                    Type
                    Name
                    Facility

The first four menu options shall require that the user first select the FCA to be edited, deleted, copied, or examined. When the user clicks on the row number, the TSD shall select the row. The TSD shall allow the user to select multiple rows using the normal multiple selection methods (click, shift click, ctrl-click). If multiple rows are selected, the TSD shall disable the Edit, Copy, and Examine options.

If the user is not authorized to create or edit Public FCAs and if a Public FCA has been selected, the TSD shall disable the Edit and Delete menu options. If the user is not authorized to edit or delete the Shared FEA that has been selected, the TSD shall disable the Edit and Delete menu options. A user shall only be able to edit or delete a Shared FEA if that FEA was created on a workstation at the user's site.

When the user selects the **Edit** menu option, the TSD shall display the Edit FEA/FCA dialog box containing the data for the selected FCA. However, if no FCA has been selected, the TSD shall display the error dialog box with the appropriate error message (See Section 5.0).

When the user selects the **Delete** menu option, the TSD shall display the Delete Confirmation dialog box. However, if no FCA has been selected, the TSD shall display the error dialog box with the appropriate error message (See Section 5.0). When the user confirms the delete function, the TSD shall send a Delete FCA message to the RRSVR process. Also when the user confirms the delete function, the TSD shall apply the deletion to the Select FEA/FCAs dialog box as though the user had pressed the Apply button in the Select FEA/FCAs dialog box. (This means any changes in Select FEA/FCAs shall be applied when a FCA is deleted.) When the confirmation message is received from the RRHUB, the TSD shall briefly display the Notification Dialog Box with the confirmation message that is returned from the RRHUB.

When the user selects the **Copy** menu option, the TSD shall display the Copy FEA/FCA dialog box containing the data for the selected FCA except that the name field shall be blank and the FCA Domain shall be the default value. However, if no FCA has been selected, the TSD shall display the error dialog box with the appropriate error message (See Section 5.0).

When the user selects the **Examine** menu option, the TSD shall display the FEA/FCA Timeline dialog box for the selected FCA.

When the user selects the **Sort by** menu and sub-menu option, the TSD shall sort the rows in the dialog box in ascending order of the item selected. The secondary sort order shall always be the Name.

4.2.2   Delete Confirmation Dialog Box

When the **Edit>Delete** menu option is selected on the Select FEA/FCA dialog box and one FCA has been selected, the TSD shall display the FCA Delete Confirmation dialog box. When the **Yes** button is clicked, the TSD shall send a Delete message to the RRSVR process on the fileserver.

```
┌──────────────────────────────────────────┐
│  Delete Confirmation                       │
├──────────────────────────────────────────┤
│                                            │
│  Do you really want to delete FEA/ FCA: name?  │
│                                            │
│  ┌────────┐              ┌────────┐        │
│  │  Yes   │              │   No   │        │
│  └────────┘              └────────┘        │
└──────────────────────────────────────────┘
```

Figure 4.2.2   Delete Confirmation Dialog Box

When the TSD sends the Delete FCA message, the TSD shall briefly display the notification dialog box with the message:

Deletion request has been sent the FCA Database Server

FCA will be deleted when the request is confirmed.

When the user confirms the delete function by clicking the **Yes** button, the TSD shall send a Delete FCA message to the RRSVR process, which will then forward the request to the RRHUB.

When the confirmation message from the RRHUB is received by the TSD, the TSD shall briefly display the confirmation message. The TSD shall automatically remove this dialog box after a few seconds.

If the **No** button is clicked or the **<Esc>** key is pressed, the TSD shall close the Delete Confirmation dialog box without deleting any FCAs. (The Select FEA/FCAs dialog box shall continue to be displayed until the user cancels that dialog box.)

4.2.3   FEA/FCA Information Dialog Box

When the Info button is pressed, the TSD shall display the FEA/FCA Information dialog box. This dialog box, which is shown in Figure 4.2.3 for FCAs that are defined by custom polygons, shows the FCA parameters as they are defined in the database. The title of the dialog box shall display the name of the FCA. The dialog box for FCAs that are defined as NAS elements shall replace the items: Ceiling, Floor, Heading, and Speed with NAS Element Name and Type. If the FCA is a shared FCA, the TSD shall display the sites that are specified for sharing the FCA. The TSD shall display the active flight filters that are specified for the FEA/FCA. Table 4.2 lists the label that shall be displayed for each active filter.

```
┌─────────────────────────────────┐     ┌─────────────────────────────────┐
│  │      Information for FCA NAME  │     │      Information for FCA NAME    │
│  ├──────────────────────────────  │     ├──────────────────────────────   │
│  Created By: VNTSCF WKSTN01       │     │  Created By: VNTSCF WKSTN01      │
│  Updated By: VNTSCF WKSTN01       │     │  Updated By: VNTSCF WKSTN01      │
│  Last Update: 2000 11/20 21:31:18 │     │  Last Update: 2000 11/20 21:31:18│
│  Start Date/Time:    10/30/00 12:34│    │  Start Date/Time:    10/30/00 12:34│
│  End Date/Time:      10/30/00 14:34│    │  End Date/Time:      10/30/00 14:34│
│       Ceiling:   600              │     │  NAS Element Type:  SECTOR       │
│       Floor:     100              │     │  NAS Element Name:  ZKC21        │
│       Heading:   270              │     │                                  │
│       Speed:      50              │     │                                  │
│  Sharing Sites: ZKC ZID ZFW       │     │  Sharing Sites: ZKC ZID ZFW      │
│   Arrive at: BOS                  │     │   Arrival: BOS                   │
│  Depart from: ORD                 │     │  Depart from: ORD                │
│  other active flight filters      │     │  other active flight filters     │
│  ───────────────────────────────  │     │  ─────────────────────────────── │
│            ┌──────┐               │     │            ┌──────┐              │
│            │  OK  │               │     │            │  OK  │              │
│            └──────┘               │     │            └──────┘              │
└─────────────────────────────────┘     └─────────────────────────────────┘
```

Figure 4.2.3   FEA/FCA Information Dialog Box

The TSD shall display information pertaining to the active flight filters in the FEA/FCA Information Dialog Box. For each filter criteria that has been defined for the FEA/FCA, the TSD shall display a label that identifies the filter criteria followed by the filter specification(s). The TSD shall only display information for filter criteria that are active (have filter specifications).

Table 4.2 lists the label that the TSD shall display for each filter criteria. The table also defines the format that the TSD shall use for displaying the filter specifications. Each item in the filter specifications shall be separated by a space unless otherwise specified in the following table. The TSD shall display this information following the list of Sharing Sites if any. The TSD shall use multiple lines for each filter criteria if necessary to list all of the specified filter specifications.

Filter	Label	Format for filter specification
Do depart from	Depart from:	List of airports or ARTCCs.
Do not depart from	Don't depart from:	List of airports or ARTCCs.
Arrive at	Arrive at:	List of airports or ARTCCs.
Do not arrive at	Don't arrive at:	List of airports or ARTCCs.
Do traverse	Traverse:	List of sectors, fixes, or ARTCCs.
Do not traverse	Don't traverse:	List of sectors, fixes, or ARTCCs.
Do use airway	Use airway:	List of airway designators
Do not use airway	Don't use airway:	List of airway designators
Are located in	Located in:	List of sectors or ARTCCs.
Are not located in	Not located in:	List of sectors or ARTCCs.
Are aircraft type	Aircraft type:	List of aircraft type designators.
Are not aircraft type	Not aircraft type:	List of aircraft type designators.
Do have remarks	Remarks:	List of remarks keywords.
Do not have remarks	Don't have remarks:	List of remarks keywords.
Do have heading	Heading:	Heading "$\pm$" Range
Do not have heading	Don't have heading:	Heading "$\pm$" Range
Do have ACID	ACID begins with:	List of ACIDs.
Do not have ACID	ACID doesn't begin:	List of ACIDs.
Highest flight level	Highest flight level:	Highest flight level
Lowest flight level	Lowest flight level:	Lowest flight level
Aircraft category	Aircraft category:	If all aircraft categories are selected, the TSD shall not display these filter criteria in the Info dialog box. Otherwise for the selected categories, the TSD shall list "J" for Jet, "P" for Prop, and "T" for Turbo.
Weight class	Weight class:	If all weight classes are selected, the TSD shall not display these filter criteria in the Info dialog box. Otherwise for the selected classes, the TSD shall list "L" for Large, "H" for Heavy, and "S" for Small.
User category	User category:	If all user categories are selected, the TSD shall not display these filter criteria in the Info dialog box. Otherwise for the selected categories, the TSD shall list the following single letter codes: T=Air Taxi, F=Cargo, C=Commercial, G=General Aviation, M=Military.

Table 4.2   Specification for Flight Filter Information

None of the fields in this dialog box shall be modifiable. When the **OK** button is pressed, the TSD shall close the dialog box.

4.3   Recall, Save, Delete FEA/FCA Files Dialog Boxes

4.3.1   Recall FEA/FCA File Dialog Box

When the user selects the Recall FEA/FCA option on the main FEA/FCA menu or the Recall FEA/FCA File option on the File menu in the Select FEA/FCA dialog box, the TSD shall display the file selection dialog box shown in Figure 4.3.1. This dialog box shall allow the user to select the file name for the FCA that will be recalled.
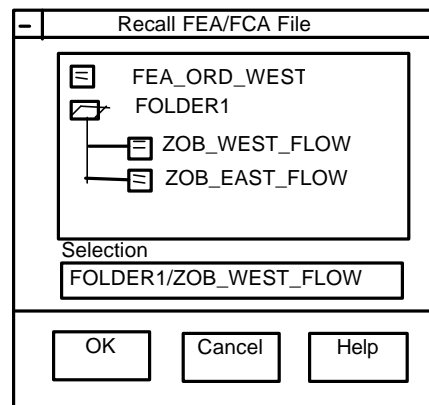

Figure 4.3.1   Recall FEA/FCA File Dialog Box

This dialog box shall list the files stored in the default directory for FCA files, which is called the FCA Files directory. This directory shall be the directory */etms/tsd/adapt/fca_files* on the workstation that is defined in the Set FEA/FCA Defaults dialog box. The TSD shall show subdirectories as folder icons. (The TSD shall not allow the user to view higher-level directories.) The display of the list shall be based upon the XRT Outliner widget that shall allow the user to selectively view the contents of subdirectories by double clicking on the folder icon to open or close the folder. When an item in the list is selected, the "Selection" text entry field shall display the file name (along with subdirectory names when appropriate). The Selection field shall accept user input from the keyboard. If the text entered starts with a "/" character, the TSD shall assume that the text is a full path name. If the text entered does not start with a "/" character, the TSD shall assume that the file name (which may include subdirectories) is relative to the FCA Files directory.

If the **Cancel** button is clicked, the TSD shall close the dialog box without recalling the FCA.

The TSD shall display an error message if the file name specified cannot be found or cannot be accessed when the **OK** button is clicked. In this case, this dialog box shall not be closed so that the file name can be corrected before retrying to find the file.

When the **OK** button, the TSD shall validate that the file specified is an FCA file. [Developer note: This feature was implemented in the Select Flights File>Recall function.] If the TSD detects that the file is not valid or the TSD has problems reading or processing the file, the TSD shall ignore the file and display an error message.

If the file specified is valid, the TSD shall display the appropriate version of the Edit FEA/FCA dialog box with the fields filled in with the definition of the FCA that is recalled. [Note that there are three versions of the Edit FEA/FCA dialog box, one for Polygons, one for Circles, and the

other for NAS elements. The TSD shall use the appropriate version.] However the TSD shall update the date and time fields according to the rules that are described below. The TSD shall change the name of the FEA to be the same as the filename. The TSD shall change the domain to be Private.

The requirement is that the TSD change the date to be appropriate for the current date but that the TSD not change the time. In most cases, the appropriate date for the start and end date/time will be the current date. However under some circumstances that appropriate date will be tomorrow's date. The reason for this requirement is that some FCAs will be used to evaluate traffic flows that occur every day around the same time. Thus the date needs to be current but the time should be unchanged when the FCA is recalled.

The following are the rules for setting the start and end dates:

1. If the start time is before the current time, the start and end dates shall be tomorrow's date.

2. Else, if the start time is after the current time and the end time is before the current time, the start date shall be the current date and the end date shall be tomorrow's date.

3. Else, if the start time is after the current time and the end time is after the current time, the start and end dates shall be the current date.

4.3.2   Save FEA/FCA File Dialog Box

To save an FCA, the user must first select the FCA to be saved. If no FCA has been selected, the TSD shall gray out the File>Save FEA/FCA File menu option.

When the Save FEA/FCA File menu option is selected, the TSD shall display the dialog box shown below:

Figure 4.3.2   Save FEA/FCA Dialog Box

The Save FEA/FCA File dialog box shall list the files stored in the FCA Files directory and any of its subdirectories, which are shown as folder icons. When an item in the list is selected, the "Save As" text entry field shall display the file name (along with subdirectory names when appropriate). The "Save As" field shall accept user input from the keyboard. Folders shall be created when subdirectories are included in the pathname. (e.g. *NewFolder/TestFiles/Test1*) If

the text entered starts with a "/" character, the TSD shall assume that the text is a full path name and the TSD shall display an error message that the file name is invalid. If the text entered does not start with a "/" character, the TSD shall assume that the file name (which may include subdirectories) is relative to the FCA Files directory. If a sub folder has been selected, the TSD shall fill in the Save As field with the subdirectory name so that the user only has to specify the file name.

When the dialog box is opened, the name of the FCA shall be displayed in the *Save As* field.

When the **OK** button is clicked, the TSD shall save the FCA parameters to the FCA file named in the "Save As" field. The access permissions for these files should be set to 666, which will allow all users to read and write these files. If a file of the same name already exists, the TSD shall display a confirmation message (described in Section 4.4) to the user before overwriting the file. If the TSD encounters problems writing the file, the TSD shall display an error message.

If the **Cancel** button is clicked, the TSD shall close the dialog box without saving the FCA file.

4.3.3 Delete FEA/FCA Files Dialog Box

The Delete FEA/FCA File function shall allow the user to delete the FCA file(s) with the name(s) specified.

When the Delete FEA/FCA File menu option is selected, the TSD shall display the dialog box shown below:
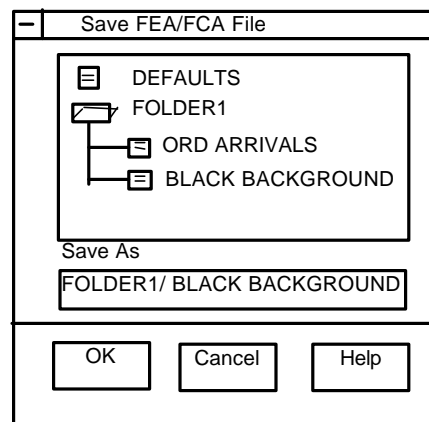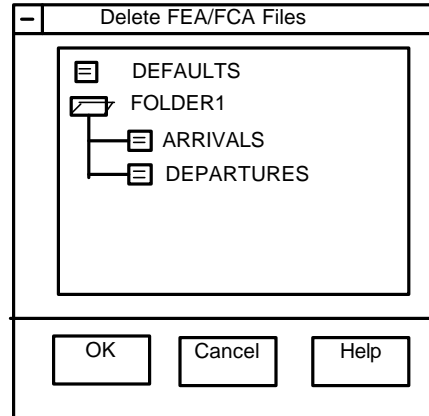

Figure 4.3.3   Delete FEA/FCA Dialog Box

The Delete FEA/FCA Files dialog box shall list the files stored in the FCA Files directory and any of its subdirectories. When the user double clicks on a folder icon, the TSD shall open the folder and display the files or subfolders that are contained in the corresponding subdirectory. The TSD shall allow the user to select the files and folders to be deleted using the normal selection methods. (Single click or ctrl-click selects/deselects the item and shift click selects a range of items.)

The TSD shall allow the user to delete empty folders (subdirectories). However if the user attempts to delete a subdirectory that contains other subdirectories or files, the TSD shall display an error message.

When the **OK** button is clicked, the TSD shall display confirmation dialog box, shown in Figure 4.3.4, before deleting the file named in the *Delete* field. Before actually deleting a file, the TSD shall validate that the file is an FCA file. If it is not an FCA file, the TSD shall not delete the file and the TSD shall display an error message. If the TSD encounters problems deleting the file, the TSD shall display an error message to the user.

If the **Cancel** button is clicked, the TSD shall close the dialog box without deleting any files or subdirectories.

4.3.4 Delete Confirmation Dialog Box

The TSD shall display the Confirmation dialog box, shown in Figure 4.3.4, when the user invokes the Delete command.

```
┌──┬──────────────────────────────────────────────┐
│ ─│        Delete Confirmation Dialog             │
├──┴──────────────────────────────────────────────┤
│                                                  │
│   ?  Do you really want to delete the selected file(s)? │
│                                                  │
│  ┌──────────┐                    ┌──────────┐    │
│  │   YES    │                    │   NO     │    │
│  └──────────┘                    └──────────┘    │
└──────────────────────────────────────────────────┘
```
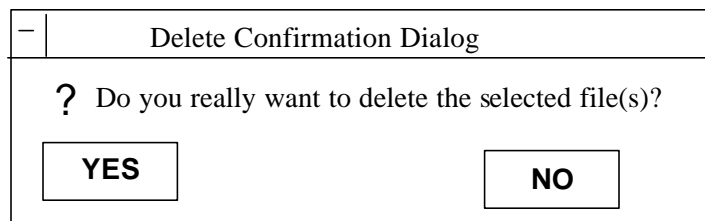
Figure 4.3.4   Delete Confirmation Dialog Box

When the user clicks on the YES button, the TSD shall delete the selected files. However before actually deleting a file, the TSD shall validate that the file is an FCA file. If it is not an FCA file, the TSD shall not delete the file and the TSD shall display an error message. If the TSD encounters problems deleting the file, the TSD shall display an error message to the user.

4.4   Create FEA/FCA Dialog Box

When the **FEA/FCA>Create FEA/FCA** menu option is selected, the TSD shall display the Create FEA/FCA dialog box. This dialog box shall provide the user with the capability to create a new FCA and designate whether it is a Private, Shared, or Public FCA. This dialog box shall have four tabs. The first tab, Parameters, shall provide the fields to enter the Time Period, the geometry characteristics, and the domain and type of the FCA. The second tab, Flight Filters, shall provide the fields to enter the flight filter parameters. The third tab, Shared Sites, shall provide the fields to enter the sites that will share the FCA definition. The fourth tab, Lat/Lon Edit shall provide the fields to enter or edit the latitude and longitude of the polygon points.

4.4.1   Parameters Tab in the Create FEA/FCA Dialog Box

Figure 4.4.1 shows the three versions for the Parameters tab in the Create FEA/FCA dialog box. If the user has selected the polygon radio button, the TSD shall display the version that is shown on the left. If the user has selected the Circle radio button, the TSD shall display the middle version. If the user has selected the NAS radio button, the TSD shall display the version that is shown on the right. In the Drawing Control section of the NAS element version, the TSD shall gray out the check box and the erase and undo buttons.

When the TSD displays the Create FEA/FCA dialog box as the result of selecting the FEA/FCA>Create FEA/FCA menu option, the dialog box shall show the default preferences that the user has specified in the Set FEA/FCA Preferences dialog box. The "Name" field shall be blank. The Color shall be the default FCA overlay color that is defined in the Set FEA/FCA Preferences dialog box. The "Speed" and "Heading" fields shall be zero. The check box for "Draw at start time position" shall be OFF. The keyboard focus shall be on the "Name" field. The shared sites shall be the default sites specified in the Set FEA/FCA Defaults dialog box.

The **Name** field shall accept a maximum of 30 characters. This field shall be sized to display at least 14 "W" characters. It shall scroll horizontally if needed to enter or display additional characters. The TSD shall provide a horizontal scroll bar if the name exceeds the maximum number of characters that are visible in the field at one time. The balloon help for this field shall be: "Enter up to 30 characters, no spaces."

Figure 4.4.1   First Tab of the Create FEA/FCA Dialog Box

When the **Color** button is pressed, the TSD shall display the Color Palette from which the user can select one of the 36 colors. When the Color Palette is closed, the TSD shall redraw the polygon in the selected color. [Color changes should take effect immediately so that the user can see the polygon being drawn in the desired color. We don't want to wait until OK or Apply is pressed, since those buttons imply that the FCA create process has been completed.]

The **Start Date** and **Time** fields shall be initially filled in with the date and time of the current 15-minute time interval. The Start Date shall be formatted as mm/dd/yy. The start time shall be formatted as hh:mm. The increment/decrement buttons shall increment (or decrement) the field that has the cursor by one month, day, year, hour, or minute. The vertical arrow keys on the keyboard shall also increment (or decrement) the field that has the cursor by one. The horizontal arrow keys shall move the cursor between fields. The fields shall also accept user input from the keyboard. When focus leaves either field, the TSD shall display the field in red if the value in the field is invalid. The balloon help for this field shall be: "Enter the desired value or use the vertical arrow keys or buttons to increment/decrement the value at the cursor position."

The **End Date** and **Time** fields shall be initially filled in with the Start date/time plus the default duration as defined in the Set FEA/FCA Defaults dialog box. The date and time fields shall be incremented (or decremented) as described above for the Start Date/Time fields. The fields shall also accept user input from the keyboard. When focus leaves either field, the TSD shall display the field in red if the value in the field is invalid. The balloon help for this field shall be: "Position cursor in the desired date or time field. Use vertical arrow keys or buttons to increment or decrement the value."

The **Ceiling** field shall initially be filled in with the default value for the Ceiling as defined in the Set FEA/FCA Defaults dialog box. This field shall accept 1-3 digit values for the ceiling from 000 to 600. The units for this field shall be hundreds of feet. The balloon help for this field shall be: "Valid values 0-600 (100 ft)"

The **Floor** field shall initially be filled in with the default value for the Floor as defined in the Set FEA/FCA Defaults dialog box. This field shall accept 1-3 digit values for the ceiling from 000 to 600. The units for this field shall be hundreds of feet. The balloon help for this field shall be: "Valid values 0-600 (100 ft)"

The **Speed** field shall initially have a value of zero. This field shall accept 1-3 digit values from 000 to 999. The units for this field shall be knots. The balloon help for this field shall be: "Valid values 0-999 knots"

The **Heading** field shall initially have a value of zero. This field shall accept 1-3 digit values from 000 to 359. The units for this field shall be degrees. The balloon help for this field shall be: "Valid values 0-359 degrees"

If the user has selected the NAS option, the TSD shall display the NAS ELEMENT portion of the dialog box and not show the section for specifying the ceiling, floor, heading, and speed parameters. The NAS ELEMENT section shall include two fields. The topmost field shall allow the user to select the type of NAS element from a pick list that includes the following types:

SECTOR	Sector
FIX	Fix
TRACON	Tracon
SUA	Special Use Area
AP_ARR	Airport Arrivals
AP_DEP	Airport Departures

When the dialog box is first opened, the NAS element type shall be "SECTOR".

The Name field for the NAS element shall be a text field with an automatic fill in feature. When the user types, the TSD shall fill in the field with the first match that is found in the pull down list. The TSD shall derive the items in the pull down list from data files in the */etms/tsd/data/DADB* directory. The following files shall be included in the DADB directory:

> sector.mon
> fix.mon
> tracon.mon
> sua.mon
> airport.mon

The elements in each file shall be sorted alphabetically. In addition to the element names, these files shall include the coordinates of the points needed by the TSD to draw the element as an FCA. For all elements types except SUA, these files shall contain only the list of monitored elements. [The reason for this is that the FCATA processing will rely upon the fact that the element is monitored.]

These files shall have the following format:

Field	Description	Max Length
NAS Element Name	Name of the NAS element. A single space shall separate this field and the subsequent field. (When the files are created, spaces in the name shall be replaced by an underscore character.)	64 char
Location(s) of the element	Character strings of the points that define the location of the element. A point element (airport, fix) shall have one point specified. An area element (sector, SUA) shall have multiple (at least 3) points defined. A single space shall separate each point. Each point shall be defined in hundredths of degrees in the format: $\pm$latitude coordinate,$\pm$longitude coordinate. (e.g. 6789,12345 is 67.89°N and 123.45°W)	variable
New Line	New Line character as a record terminator	1

If the user has selected the Circle option, the TSD shall display the CIRCLE PARAMETERS portion of the dialog box and not show the section for specifying the heading and speed parameters. The CIRCLE PARAMETERS section shall include two fields. The Center field shall allow the user to enter the latitude and longitude of the center of the circle. The format for this data shall be: ddmmN/dddmmW. (Note that this format is also used in the Move/Zoom dialog box.) The Radius field shall allow the user to enter the radius of the circle in nautical miles. The TSD shall allow values from 1 to 999.

In the "**Characteristics**" section of the dialog box, the TSD shall provide two option menus. The first shall specify the Domain of FCA (Public, Shared, and Private). The TSD shall disable the Public option as the default behavior. (This option shall only be allowed for ATCSCC users.)

The TSD shall enable this option if the Tsd X application resource file contains the following resource definition:

       Tsd*PublicFCAPrivileges: TRUE.

The TSD shall display the Type as "FCA" when the domain is Public. When the domain is Private or Shared, the TSD shall display the Type as "FEA".

The second option menu shall specify the Reason for the FCA. The option menu shall display the options that are listed in the file: */etms/tsd/data/fca_reasons_options*. This file shall initially contain the following options. [These are the standard OPSNET categories.]

       WEATHER
       VOLUME
       RUNWAY
       EQUIPMENT
       OTHER
       NONE

The default selection shall be NONE since the Reason field shall not be required if the type is FEA.

When the dialog box is opened, the TSD shall set the options for the FCA Domain and FCA Type to be the default settings as specified in the Set FEA/FCA Defaults dialog box.

The Drawing Control section of the dialog box is described in Sections 4.4.2 and 4.4.3.

When the **OK** button is pressed in the Create FEA/FCA dialog box, the TSD shall close the polygon and perform the following validation of the data entered into the fields of the dialog box:

1. Validate that the name is not the same as an existing FCA.

2. Validate that the name does not contain any spaces. [Spaces are not allowed since List Server can't handle names with spaces.]

3. If the Domain is Shared or Private, validate that the name does not begin with "FCA". [Names that begin with 'FCA' are reserved for Public FCAs.]

4. If the Domain is Shared, validate that the current ETMS site is the same as the Creation Site.

5. For a Circle FCA, validate that the latitude and longitude of the center point are valid values and that the value of the radius is between 1 and 999 inclusive.

6. Validate that none of the fields contain the special character '%'. [This character is reserved as a delimiter for fields in messages and the database.]

7. Validate that the Start date/time is less than 15 hours in the future and that it is equal to or greater than the start of the current 15-minute interval.

8. Validate that the End date/time is greater than the current date/time plus 30 minutes and that it is less than 15 hours in the future. (The End Time must be more than 30 minutes in the future to avoid the End Time Warning. It cannot be greater than 15 hours in the future since ETMS cannot predict flight data beyond that time.)

9. Validate that the End Date/Time is greater than the Start Date/Time by at least 15 minutes.

10. Validate that the Ceiling and Floor values are between 0 and 600 inclusive.

11. Validate that the Heading of the FCA is between 0 and 359 inclusive and that the Speed is between 0 and 999 inclusive.

12. Validate that at least three points have been defined for the polygon if the 'Polygon' option is specified.

13. For a custom polygon, validate that none of the sides of the polygon cross.

14. If the Domain is Public, validate that the Reason is not equal to "NONE".

15. Replace airport aliases in the Departure or Arrival flight filter fields with the appropriate list of airports.

16. Validate that the Heading field in the flight filter is either blank or has a value between 0 and 359.

17. Validate that the Range field in the flight filter is either blank or has a value between 0 and 180.

18. Validate that if either the Heading or Range field in the flight filter is blank, that the other field is also blank.

19. Validate that the Lowest and Highest Flight Levels in the flight filter are between 000 and 600 inclusive and that the Highest Flight Level is greater than or equal to the Lowest Flight Level.

20. Validate that the Departure or Arrival Start and End Times in the flight filter are valid times. [Note that it is valid to have the End Time less than the Start Time since in that case the End Time refers to the next day.]

21. Validate that none of the fields contain more than the maximum number of characters allowed.

22. Display the appropriate error message if the validation fails.

If the FCA is valid, the TSD shall then perform the following functions:

1. The TSD shall toggle on the display of FCAs if they are hidden.

2. The TSD shall draw the FCA on the display and temporarily add the FCA to the list of FCAs in the Select FEA/FCA dialog box (see Section 4.3.1 below).

3. The TSD shall close the dialog box if the **OK** button is pressed. (If the **Apply** button is pressed, the dialog box shall remain open.)

4. The TSD shall assign the fca_id to the FCA. The fca_id shall have the format:

   {fca}{.}<site>{.}<creation workstation>{.}<creation date/time (yyyymmddhhmmss)>
       e.g. fca.opensyse.wkstn01.20000104114523

5. If the Highest Flight Level and Lowest Flight Level in the flight filter are 600 and 000, then the TSD shall send a blank field for the Flight Level Filter in the Update FCA message.

6. The TSD shall send an Update FCA message to the Local RRSVR.

When the TSD sends the Update FCA message, the TSD shall briefly display the notification dialog box with the message:

   Definition has been sent the FCA Database Server

When the TSD receives the confirmation message from the RRHUB, the TSD shall briefly display the notification dialog box with the confirmation message received from the FCA Database Server. The TSD shall request flight data for the FCA since it is being shown.

If the TSD receives an error message from the RRHUB, the TSD shall display the Error Dialog Box showing the text of the error message. When the OK button is pressed in the Error Dialog Box, the TSD shall display the Edit FEA/FCA dialog box. (Note if user pressed the Apply button in the Create FEA/FCA dialog box, it will still be open. However it can't be used to edit the FCA since the Create FEA/FCA dialog box attempts to create a new FCA each time that OK or APPLY is pressed.) This dialog box shall contain the same FCA definition that the user specified in the Create FEA/FCA dialog box. This will enable the user to correct the problem and then to re-send the update or cancel the process.

4.4.2   Drawing Control Section of the Create FEA/FCA Dialog Box for Polygons

The Drawing Control section of the Create FEA/FCA Dialog box when the Polygon option is selected shall allow the user to invoke TSD actions that are needed in order to draw or edit the FCA polygon on the TSD display.

The TSD shall provide a check box that allows the user to specify if the FCA is drawn at the position that is associated with the current time or that associated with the start time. If the check box is unchecked, the polygon that is drawn shall define the position of the FCA at the current time.

When the Polygon mode is selected, the TSD shall display the cross hair icon at the pointer location whenever the pointer is on the TSD display. The TSD shall display the standard arrow pointer icon whenever the pointer is on a dialog box. [This is similar to the DME function.] When the pointer is on the TSD display (shown as a crosshair) and the mouse is clicked, the TSD shall

define the current pointer location as a point of the polygon. If the user holds the left mouse button down for more than ½ second, the TSD shall continuously capture points at the rate of 5 per second as long as the mouse button is held down. [This will allow the user to trace an irregular shape more easily.] The TSD shall define the FCA polygon as an ordered series of latitude/longitude points that are connected by great circle lines. Thus the first click shall define the first point; the second click shall define the second point; etc. When the FCA is being drawn or edited (using Create FEA/FCA or Edit FEA/FCA dialog boxes), each point of the polygon shall be drawn as a small circle in the FCA color. The TSD shall draw the circle using the same size icon as the TSD currently uses for drawing airports. However when an FCA is being drawn as an overlay, the TSD shall draw the FCA without the circle icons at each point.

After the third point is defined, the TSD shall close the polygon by drawing a dashed line from the last point to the first point of the polygon. The purpose of this is to allow the user to see where the edges of the polygon will be drawn if they were to press the OK button.

If the user attempts to define a point that will result in an irregular polygon (sides crossing), the TSD shall not capture the point and the TSD shall display the pop-up message "Crossing segment not allowed".

The TSD shall allow the user to define up to 64 points. If the user attempts to define more than 64 points, the TSD shall display an error message. (See Section 5.)

The TSD shall provide two action buttons for invoking the drawing functions – Erase and Undo. The functions that these buttons shall perform are described in the following paragraphs. The TSD shall provide balloon help for each of these buttons. The balloon help for the Erase button shall be: "Erases the FCA polygon". The balloon help for the Undo button shall be: "Deletes the last point".

When the **Erase** button is clicked, the TSD shall erase the FCA polygon from the TSD display and remove all points from the list of defined points. If no points have been defined, or all points have been deleted the TSD shall gray out the Erase button.

When the **Undo** button is clicked, the TSD shall delete the last point of the polygon. The user shall be able to repeatedly click the Undo button until all previously defined points of the polygon have been deleted. [A nice to have feature if no points have been defined, or all points have been deleted is to have the TSD gray out the Undo button.]

4.4.3   Drawing Control Section of the Create FEA/FCA Dialog Box for Circles

This section defines the requirements for the Drawing Control section of the Create FEA/FCA dialog box when the Circle option is selected. This section of the dialog box shall allow the user to invoke TSD actions that are needed in order to draw the FCA as a circle on the TSD display.

The TSD shall gray out the "Drawn at start time position" check box.

When the Circle mode is selected, the TSD shall display the cross hair icon at the pointer location whenever the pointer is on the TSD display. The TSD shall display the standard arrow pointer icon whenever the pointer is on a dialog box. [This is similar to the DME function.] When the pointer is on the TSD display (shown as a crosshair), the TSD shall display the current latitude and longitude of the pointer in a window directly above the pointer. This window shall move with

the pointer. When the left mouse button is pressed, the TSD shall define the current pointer location as center point of the circle. The TSD shall then display the latitude and longitude of the center point in the Center field in the dialog box. As the user holds the left mouse button down and drags the pointer, the TSD shall draw a circle from the center point to the current location of the pointer. The TSD shall display the value of the radius, in nautical miles, in place of the latitude and longitude in the moving window. When the left mouse button is released, the TSD shall display the circle on the TSD, remove the moving window, and display the radius in the Radius field in the dialog box.

The TSD shall approximate the circle by defining up to 64 polygon points. [The FCATA shall process the FCA in the same manner as a custom polygon.]

The TSD shall provide two action buttons for invoking the drawing functions – Erase and Draw. The functions that these buttons shall perform are described in the following paragraphs. The TSD shall provide balloon help for each of these buttons. The balloon help for the Erase button shall be: "Erases the FCA polygon". The balloon help for the Draw button shall be: "Draws the FCA circle".

When the **Erase** button is clicked, the TSD shall erase the FCA circle from the TSD display. The TSD shall also delete the values in the Center and Radius fields in the dialog box.

When the **Draw** button is clicked, the TSD shall validate the entries in the Center and Radius fields in the dialog box and draw the circle FCA. The purpose of this button is to allow the user to draw the circle FCA when they have entered the center and radius parameters into the fields in the dialog box.

When the right mouse button is clicked, the TSD shall perform the undo function just as if the user had clicked the Undo button as described above. If the user holds the right mouse button down for more than ½ second, the TSD shall continuously undo points at the rate of 5 per second as long as the mouse button is held down.

When the **OK** button is clicked, the TSD shall close the polygon by drawing a line between the last point and the first point of the polygon. (See Section 4.10 for a description of drawing the FCA.)

4.4.4   Flights Filter Tab in the Create FEA/FCA Dialog Box

The second tab in the Create FEA/FCA dialog box shall allow the user to define the parameters for filtering the flights that intersect the FCA. Figure 4.4.2 shows this tab.

The TSD option buttons at the beginning of the first nine rows shall display the options: do/do not or are/are not. These option menus shall provide the user with the capability of defining whether the filter criteria shall be inclusive or exclusive of the items specified. The default for all of these option buttons shall be the inclusive option ('do' or 'are'). [Note to developer: These could be toggle buttons if desired since there are only two choices.]

The "Select" button in the row for Remarks shall show a dialog box that is table that lists the valid entries in the Remarks field. This list shall be derived from the file: */etms/shared/data/remarks_keywords*. When the user selects one or more of these items, the TSD shall append that item(s) to the end of the text in field for "remarks". Each item shall be separated by a space. The TSD shall allow the user to enter or edit text in the "remarks" field.

Figure 4.4.2   Second Tab of the Create FEA/FCA Dialog Box

The option button for the active/proposed field shall display the options: Active/Proposed/All. The default shall be the 'All' option.

The option button at the bottom of the tab shall display the options: depart/arrive/no filter. The default shall be the 'no filter' option. When the "no filter" option is selected, the TSD shall change the values for the Start and End times to "0000".

The table shown below describes the text entry fields in the Flights Filter tab. ETMS shall treat multiple entries within each field that are separated by one or more spaces as though they were combined with a logical OR operation. [It is anticipated that in some future release, ETMS will allow the user to enter logical expressions in these fields using 'AND' and 'OR' logical operators. It is anticipated that the logical operator 'NOT' will not be permitted since that could easily become confusing to the user.] For release 7.3, the TSD shall allow the user to enter any text string in these fields and the TSD shall pass this text string to the FCATA exactly as the user entered it.

All of the text entry fields that accept multiple entries shall display a scroll bar if necessary for the user to enter or view multiple entries that are outside of the visible are of the field. It is desired to keep the width of this tab as small as possible. Therefore the text entry fields shall be sized to

accept 12 characters without scrolling. [This will allow two sector names to be entered without scrolling.]

Field	Specification
Departure	The Departure field shall limit the selection to flights that depart from the listed airports(s) or an airport in the listed ARTCC(s). The TSD shall accept one or more airport designators and/or one or more ARTCC designators. This field shall also accept airport aliases, which are described below. This field shall accept as many as 64 characters. The default shall be a blank field.
Arrival	The Arrival field shall limit the selection to flights that arrive from the listed airports(s) or and airport in the listed ARTCC(s). The TSD shall accept one or more airport designators and/or one or more ARTCC designators. This field shall also accept airport aliases, which are described below. This field shall accept as many as 64 characters. The default shall be a blank field.
Traverse	The Traversal field shall limit the selection to flights that traverse the listed sectors, fixes, or ARTCC(s). The TSD shall accept one or more sector, fix, or ARTCC designators. This field shall accept as many as 64 characters. The default shall be a blank field.
Airways used in FCA	The Airways Used field shall limit the selection to flights that use any of the listed airways within the FCA. This text field shall accept one or more airway designators (Jet route or Victor route). This field shall accept as many as 64 characters. The default shall be a blank field.
Located In	The Located In field shall limit the selection to flights that are currently located in the specified sector(s) or ARTCC(s). This field shall accept as many as 64 characters. The default shall be a blank field.
Aircraft Type	The Aircraft Type field shall limit the selection to flights of specific aircraft types. This field shall accept one or more aircraft type designators. This field shall accept as many as 64 characters. The default shall be a blank field.
Aircraft Remarks	The Aircraft Remarks field shall limit the selection to flights with the specified remarks keywords. This field shall accept one or more remarks keywords. This field shall accept as many as 64 characters. The default shall be a blank field.
Heading	The Heading fields shall limit the selection to flights whose heading upon entry into the FCA is equal to the specified heading $\pm$ the range. The Heading field shall accept values from 000 to 359. The Range field shall accept values from 000 to 180. The user shall be able to delete the values in these fields to indicate that no filtering is to be performed for heading. The default shall be blank fields.
Aircraft ID	The ACID field shall limit the selection to flights with aircraft IDs that begin with the characters specified by each entry. This field shall accept as many as 64 characters. The default shall be a blank field.
Highest Flight Level and Lowest Flight Level	The Highest and Lowest Flight Level fields shall limit the selection to flights whose altitude anywhere within the FEA/FCA is predicted to be between the lowest and highest flight levels (inclusive). These fields shall accept a flight altitude that is specified in hundreds of feet. The TSD shall allow only one entry in each field. The maximum entry in this field shall be 600. The minimum entry shall be 000.

Field	Specification
Aircraft Category	The Aircraft Category shall limit the selection to flights that have an aircraft category that matches one of the selected categories. If all categories are selected, the TSD shall send an empty field to the database to indicate that no filtering is required for this field. The default shall be all categories selected.
Weight Class	The Weight Class field shall limit the selection to flights that have a weight class that matches one of the selected categories. If all categories are selected, the TSD shall send an empty field to the database to indicate that no filtering is required for this field. The default shall be all categories selected.
User Category	The User Category field shall limit the selection to flights that have a user category that matches one of the selected categories. If all categories are selected, the TSD shall send an empty field to the database to indicate that no filtering is required for this field. The default shall be all categories selected.
Active/Proposed	The Active/Proposed field shall limit the selection to flights that have are Active or Proposed. Proposed flights shall be all flights that have a status of Scheduled, Filed, Airline Created, or Controlled. The TSD shall provide an option button with the choices: Active, Proposed, All. If 'All' is selected, the TSD shall send an empty field to the database to indicate that no filtering is required for this field. The default shall be 'All'.
Departure or Arrival Time	The Departure or Arrival Time fields shall limit the selection to flights that depart or arrive within the specified time period inclusive. The TSD shall provide an option button with the choices: Departure, Arrival, No Filter. If 'No Filter' is selected, the TSD shall send an empty field to the database to indicate that no filtering is required for this field. The TSD shall provide two text entry fields for entering the start and end time. The time fields shall accept time values from 00:00 to 23:59. The default shall be 'No Filter'.

The Departure and Arrival filter fields shall accept airport aliases. The purposes of airport aliases are to make it easier for the user to specify multiple airports with one entry. The TSD shall treat any word of six characters or more as an airport alias. When the user tabs out of the Departure or Arrival text entry fields, the TSD shall replace the airport alias with the appropriate list of airports that are defined in the file: */etms/tsd/data/airport_alias*. If the alias is not defined in this file, the TSD shall not replace the alias. Each line in the file shall define one airport alias. The format of the line shall be the airport alias followed by one or more airport names separated by spaces.

4.4.5   Shared Sites Tab in the Create FEA/FCA Dialog Box

The third tab of the Create FEA/FCA Dialog Box shall provide the user with the capability to specify the ETMS sites that shall share the FCA definition. This dialog box shall show a maximum of 12 rows. If more rows are added, the TSD shall provide a scroll bar.

Each row in this tab shall provide a text entry field that provides automatic completion of the entry. When the user types one or more characters into the text entry field, the TSD shall complete the entry with the first match from the pull down selection. The TSD shall not restrict the user from entering text that doesn't match any item in the selection list. However the TSD shall not allow the user to enter more than 8 characters. [Or the TSD shall validate that more than 8 characters have been entered when the OK button is clicked in the Create FEA/FCA dialog box.]

```
                         ┌──────────────┐
                         │ Shared Sites │
                  ┌──────┴──────────────┴──────────┐
                  │    Enter sites for sharing the FEA/FCA │
                  │  ┌──────────────────────────┐  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 1│ │ ZKC        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 2│ │ ZMP        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 3│ │ ZID        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 4│ │ ZOB        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 5│ │ ZME        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 6│ │ ZDV        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 7│ │ ZAU        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 8│ │ ZFW        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │ 9│ │ ZAB        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │10│ │ ZDC        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │11│ │ ZBW        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  │  ┌──┐ ┌────────────┐┌──┐  │  │
                  │  │  │12│ │ ZNY        ││ ▽│  │  │
                  │  │  └──┘ └────────────┘└──┘  │  │
                  │  └──────────────────────────┘  │
                  │  ┌──────┐┌──────┐┌──────────┐  │
                  │  │ Add  ││Delete││Reset to  │  │
                  │  └──────┘└──────┘│Defaults  │  │
                  │                  └──────────┘  │
                  └────────────────────────────────┘
```

Figure 4.4.3   Third Tab of the Create FEA/FCA Dialog Box

The field in the second column of each row shall include a text field with an automatic fill in feature. When the user starts typing, the TSD shall fill in the text field with the first item in the pull down list that matches the characters that have been typed. The TSD shall allow the user to enter text that does not match any item in the list. [This will allow the user to specify sites that for some reason are not in the list.]

The pull down selection list shall contain all operational ETMS sites with Centers listed first in alphabetical order followed by all other operational ETMS sites sorted in alphabetical order. The TSD shall obtain this list from the file that is defined as */etms/tsd/data/DADB/fca_site_list*. This file shall be updated and distributed with each 56-day update.

The **Add** and **Delete** buttons on this tab shall cause the TSD to add or delete rows in the dialog box. When the Add button is clicked, the TSD shall add one more row to the bottom of the rows. This row shall be empty. The TSD shall display scroll bars if there are more than 12 rows. When the **Delete** button is clicked, the TSD shall delete all selected rows. However the TSD shall always have at least 12 rows in the table. If necessary the TSD shall add empty rows at the bottom of the table to maintain at least 12 rows. The TSD shall allow the user to select one or more rows using the normal row selection methods (click, shift-click, or ctrl-click). The TSD shall gray out the Delete button unless one or more rows have been selected.

When the **Reset to Defaults** button is clicked, the TSD shall replace all rows in the table with the list of 'Shared Sites' that are defined in the Set FEA/FCA Defaults dialog box.

4.4.6   Lat/Lon Tab in the Create FEA/FCA Dialog Box

The fourth tab of the Create FEA/FCA Dialog Box shall provide the user with the capability to enter or edit the latitude and longitude of the polygon points. This tab shall be grayed out if the NAS radio button is selected in the Parameters tab.

Figure 4.4.4   Fourth Tab of the Create FEA/FCA Dialog Box

Each row in this tab shall provide a text entry field that shall allow the user to enter or edit the latitude and longitude of a polygon point. The rows shall be ordered in the same sequence of the points in the polygon. This dialog box shall display a minimum of 14 rows at one time and provide scroll bars to access all 64 polygon points.

The latitude and longitude values shall be displayed in NAS format similar to the display of the location in the Move/Zoom dialog box. The format shall be of the form: ddmmN/dddmmW.

The TSD shall provide three action buttons on the tab: Add, Delete, and Draw. The first two action buttons shall require that the user first select one or more rows. The user shall be able to select one or more rows using the standard methods of selecting rows: click, shift click, and ctrl click.

When the **Add** button is clicked, the TSD shall verify that one or more rows are selected and that the total number of polygon points does not equal 64. If this verification is OK, then the TSD shall create an empty row above the top most selected row by moving the data for all subsequent rows down one row. Otherwise the TSD shall display the appropriate error message.

When the **Delete** button is clicked, the TSD shall verify that one or more rows are selected. If so, the TSD shall delete the selected polygon points and shift all points up as necessary to remove all blank rows. Otherwise the TSD shall display the appropriate error message.

When the **Draw** button is clicked, the TSD shall validate that at least three points have been defined for the polygon and that none of the sides cross. If this validation is OK, the TSD shall draw the polygon on the display. Otherwise the TSD shall display the appropriate error message.

[Issue for developer: Should the polygon drawing be disabled when this tab is displayed? If not, the users are going to expect to see the data in the tab dynamically change when the polygon is drawn.]

4.4.7   Comments on temporarily adding FCAs to the Select FEA/FCA Dialog Box

When an FCA is created, there will be a period of time between the time that the user sends the FCA to the FCA Database Server at the hub-site and the time when the copy of the FCA database is updated at the user's remote site. This should be less than a minute but heavy network traffic could delay the update longer. During this time there needs to be a way for the user who created the FCA to continue to see the FCA on their TSD until their local copy of the database is updated. Likewise, when they edit an FCA, the TSD should continue to display the edited version of the FCA until the TSD receives the database update.

4.5   Edit FEA/FCA Dialog Box

The purpose of the Edit FEA/FCA dialog box is to allow the user to edit an FCA definition and then update the FCA database with this FCA definition. This dialog box shall be the same as the Create FEA/FCA dialog box, shown in Figure 4.3, except that the window title shall be "Edit FEA/FCA".

When the **Functions>Edit** menu option is selected in the Select FEA/FCA dialog box, the TSD shall display the Edit FEA/FCA dialog box. The fields in the Edit FEA/FCA dialog box shall contain the current values for that FCA.

If the TSD receives an error message from the RRHUB in response to a FCA Update message, the TSD shall display the Edit FEA/FCA dialog box. This dialog box shall show the definition of the FCA that the TSD last sent to the FCA Database Server from the Edit FEA/FCA dialog box. This will enable the use to correct the problem and then to re-send the update or cancel the process.

When this dialog box is opened, the fields in the dialog box shall display the current values for the FCA parameters. The Edit mode option in the Drawing Control section of the dialog box shall be selected and the Draw mode shall be grayed out. [Note that the Draw mode option shall only become available if the user presses the Erase button.]

The Edit FEA/FCA dialog box shall be similar to the Create FEA/FCA dialog box. The fields in this dialog box shall function as they are described in Section 4.3 for the Create FEA/FCA dialog box.

When the **OK** button is pressed in the Edit FEA/FCA dialog box, the TSD shall perform the same validation as that described in Section 4.3 for the Create FEA/FCA dialog box except that the first name validation shall be different. In this case, the TSD shall validate that the name is not the same as another FCA.

If the FCA is valid, the TSD shall toggle on FCAs if they are hidden, draw the FCA on the display and update the FCA in the list of FCAs in the Select FEA/FCA dialog box. The TSD shall then close the dialog box. When the **OK** button is pressed, the TSD shall apply the changes to the Select FEA/FCA dialog box as if the Apply button was pressed in the Select FEA/FCA dialog box.

If the FCA is valid, the TSD shall send an Update FCA message to the RRSVR Server. When the TSD sends the message, it shall briefly display the notification dialog box with the message:

> Definition has been sent the FCA Database Server

When the TSD receives the confirmation message from the RRSVR or RRHUB, the TSD shall briefly display the notification dialog box with the message:

> Database has been updated

If the TSD receives an error message from the FCA Database Server, the TSD shall display the Error Dialog Box showing the text of the error message. When the OK button is pressed in the Error Dialog Box, the TSD shall display the Edit FEA/FCA dialog box if the Edit FEA/FCA dialog box is not open. (Note if user pressed the Apply button in the Edit FEA/FCA dialog box, it will still be open. The dialog box will also be open if the user starts editing another FCA before the error message is received.) If the Edit Dialog Box is opened as the result of the error message, this dialog box shall contain the same FCA definition that the user specified in the Edit FEA/FCA dialog box. This will enable the user to correct the problem and then to re-send the update or cancel the process.

4.6   Copy FEA/FCA Dialog Box

The purpose of the Copy FEA/FCA dialog box is to allow the user to create a new FCA definition by copying and modifying an existing FCA definition. This dialog box shall be the same as the Create FEA/FCA dialog box, shown in Figure 4.3, except that the window title shall be "Copy FEA/FCA".

When the **Functions>Copy** menu option is selected in the Select FEA/FCA dialog box, the TSD shall display the Copy FEA/FCA dialog box.

When this dialog box is opened, the fields in the dialog box shall display the current values for the FCA parameters except that the Name field shall be blank and the FCA Domain shall be set to the default FCA Domain as specified in the Set FEA/FCA Defaults dialog box. The Edit mode option in the Drawing Control section of the dialog box shall be selected and the Draw mode shall be grayed out. [Note that the Draw mode option shall only become available if the user presses the Erase button.]

The Copy FEA/FCA dialog box shall be similar to the Create FEA/FCA dialog box. The fields in this dialog box shall function as they are described in Section 4.3 for the Create FEA/FCA dialog box.

When the **OK** button is pressed in the Copy FEA/FCA dialog box, the TSD shall perform the same validation as that described in Section 4.3 for the Create FEA/FCA dialog box. The TSD shall assign a new *fca_id* since a new FCA is being created. If the FCA is valid, the TSD shall

toggle on FCAs if they are hidden, draw the FCA on the display and update the FCA in the list of FCAs in the Select FEA/FCA dialog box. The TSD shall then close the dialog box. When the **OK** button is pressed, the TSD shall apply the changes to the Select FEA/FCA dialog box as if the Apply button was pressed in the Select FEA/FCA dialog box.

If the FCA is valid, the TSD shall send an Update FCA message to the RRSVR Server. When the TSD sends the message, it shall briefly display the notification dialog box with the message:

> Definition has been sent the FCA Database Server

When the TSD receives the confirmation message from the RRSVR or RRHUB, the TSD shall briefly display the notification dialog box with the message:

> Database has been updated

If the TSD receives an error message from the FCA Database Server, the TSD shall display the Error Dialog Box showing the text of the error message. When the OK button is pressed in the Error Dialog Box, the TSD shall display the Edit FEA/FCA dialog box if the Edit FEA/FCA dialog box is not open. If the Edit Dialog Box is opened as the result of the error message, this dialog box shall contain the same FCA definition that the user specified in the Edit FEA/FCA dialog box. This will enable the user to correct the problem and then to re-send the update or cancel the process.

4.7   Set FEA/FCA Preferences Dialog Box

The TSD shall display the Set FEA/FCA Preferences dialog box when the user selects the FEA/FCA>Set FEA/FCA Preferences menu option. This dialog box shall provide two tabs. The first tab shall provide the fields for specifying the default FCA parameters. The second tab shall provide the fields for specifying the default sites for sharing a Shared FCA. The default parameters that are specified in this dialog box shall be used as the defaults for the Create FEA/FCA dialog box.

When this dialog box is opened, it shall display the current specification of the FCA preference settings.

Figure 4.7.1   Set FEA/FCA Preferences Dialog Box

The first section of the first tab shall provide three radio buttons to choose between Custom Polygon, Circle, and NAS Element as the default selection. The second section (**Characteristics**), the TSD shall provide an option menu to specify the Domain of FCA (Public, Shared, and Private). The TSD shall disable the Public option as the default behavior. (This option shall only be allowed for ATCSCC users.) The TSD shall enable this option if the Tsd X application resource file contains the following resource definition:

Tsd*PublicFCAPrivileges: TRUE.

If the domain is Public, the Type shall be FCA. Otherwise the Type shall be FEA.

When the **Color button** is pressed in the Parameters section of the dialog box, the TSD shall display the color palette dialog box. This dialog box shall allow the user to select the color that will be used to display the FCA overlays. The selected color shall be displayed in the color button.

The dialog box shall provide four text entry fields for entering the default values for the ceiling, floor, FCA duration and the time range of the FEA/FCA Timeline.

The TSD shall provide two buttons that allow the user to specify their sort and column preferences for the FEA Dynamic List. When the Sort Preferences button is pressed, the TSD shall display the Sort FEA/FCA List dialog box that is described in Section 4.14.3. When the OK button in the Sort FEA/FCA List dialog box is pressed, the TSD shall temporarily store the new sort preferences. However the TSD shall not change the default sort preferences until the OK button is pressed on the FEA/FCA Preferences dialog box. When the Column Preferences button is pressed, the TSD shall display the Customize Columns dialog box that is described in Section 4.14.2. When the OK button in the Customize Columns dialog box is pressed, the TSD shall temporarily store the new column preferences. Note that when the OK button in the FEA/FCA Preferences dialog box is pressed, the sort and column preferences shall not be applied to any FEA/FCA Dynamic List that is currently open. These preferences shall only affect Dynamic List boxes that are opened after the preferences have been changed.

The TSD shall provide a checkbox for the user to specify whether the FCA End Time Warning is to be displayed for FCAs. If the option is selected, the TSD shall display the FCA End Time Warning as specified in Section 4.14. If the option is deselected, the TSD shall not display any FCA End Time Warnings.

The TSD shall provide two radio buttons that will allow the user to specify the default selection for the flight counts that are displayed in the FCA Timeline dialog box.

The TSD shall construct the pathname to the FCA files using the workstation name that the user enters in the **Fileserver workstation** field as follows:

/nfs/<workstation>/etms/tsd/adapt/fca_files

If no workstation name has been defined, the TSD shall define the pathname to the FCA files as follows:

/etms/tsd/adapt/fca_files

If the "Workstation" field is not empty when the **OK** button is pressed, the TSD shall validate that the constructed pathname is valid. If the pathname is invalid, then the TSD shall display an error message. If the pathname is valid or the "Workstation" field is empty, when the **OK** button is pressed the TSD shall update the default settings for the Create FEA/FCA dialog box. When the **Cancel** button is pressed, the TSD shall close the dialog box and not make any changes to the default settings.

[The reason for allowing the user to specify only the 'workstation' portion of the pathname instead of the full pathname is to prevent the user from deleting non-fca files from the workstation using the Delete FEA/FCA Files function.]

The TSD shall perform the following validations of the fields in the dialog box when the OK button is pressed:

1. Pathname for fca_files is valid if the workstation field is not empty.
2. Ceiling and Floor are between 000 and 600 inclusive.
3. Duration is between 15 and 900 inclusive.
4. Time Range of Timeline is between 15 and 900 inclusive.

The second tab in this dialog box shall be similar to the Shared Sites tab of the Create FEA/FCA dialog box. The features of this tab shall be the same as those specified in Section 4.4.4 for the Shared Sites tab of the Create FEA/FCA dialog box.

4.8   Examine FEA/FCA

The purpose of the Examine FEA/FCA function is to allow the user to request reports and view the flights that are predicted to intersect the FCA.

When the **FEA/FCA>Examine FEA/FCA** menu option is selected, the TSD shall display the Examine FEA/FCA dialog box, shown in Figure 4.8.1. This dialog box shall allow the user to specify the name of the FCA to be examined.

When the **OK** button is pressed, the TSD shall close the Examine FEA/FCA dialog box and display the FEA/FCA Timeline dialog box, shown in Figure 4.9.1, if the FCA has not expired. (An FCA has expired if the end date/time is before the current date/time.) If the FCA has expired, the TSD shall display the appropriate error message and the TSD shall not close the Examine FEA/FCA dialog box.

When the **Cancel** button is pressed, the TSD shall close the Examine FEA/FCA dialog box.

Examine FCA	
Name:	
OK	Cancel

Figure 4.8.1   Examine FEA/FCA Dialog Box

4.9   FEA/FCA Timeline Dialog Box

The FEA/FCA Timeline dialog box shall be shown in response to the Examine FEA/FCA function. This dialog box is shown below in Figure 4.9.1.
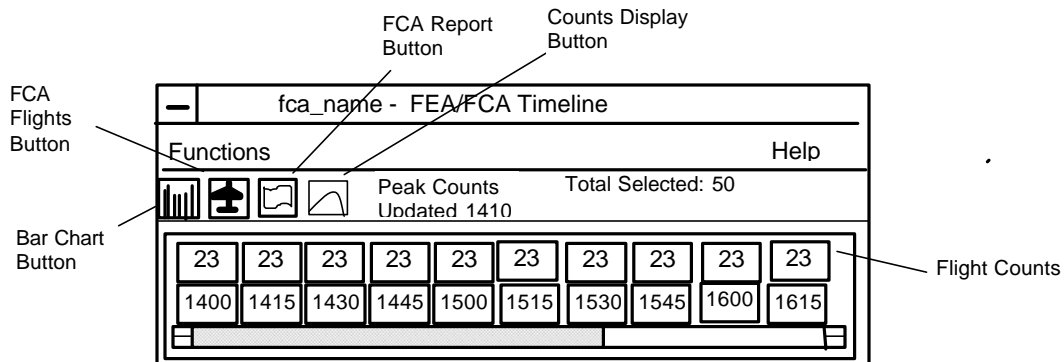
Figure 4.9.1   FEA/FCA Timeline Dialog Box

When the FCA is being examined, the TSD shall show the FCA on the display even if FCAs are not being shown. When the FCA is not being examined, the TSD shall hide the FCA is FCAs are hidden or if the "Show" button is not selected for the FCA in the Select FEA/FCA dialog box.

When focus is on the Timeline dialog box and the ESC key is pressed, the TSD shall close the dialog box. The TSD shall also close the dialog box if the user selects the "Functions>Close" menu option. When the Timeline dialog box is closed, the TSD shall cease examining the FCA. If flights are being examined for the FCA when the Timeline dialog box is closed, the TSD shall remove the flights for that FCA from the display.

The TSD shall display the Bar Chart for the FCA when the quick key "C" is pressed with focus on the Timeline dialog box window.

The TSD shall request an FCA Report for the element when the quick key "R" is pressed with focus on the Timeline dialog box window. This FCA Report shall be requested for the Time Intervals selected (the default shall be all time intervals if no time intervals are selected). The FCA Report request shall use the request script feature of the Listserver to request a standard list request of flight data for an FCA.

The TSD shall perform the FCA Flights function for the FCA when the Functions>Show Flights menu option is selected.

The FEA/FCA Timeline dialog box shall have the following characteristics:

- The dialog box shall provide the following options on the Functions menu:

        Show/Hide Bar Chart   C
        Show/Hide Flights   =
        Report by Intervals   R
        Flight List Report
        Dynamic List

Fl̲ight Counts   >   P̲eak Occupancy
                    Clo̲se   T̲otal Flights

    [Note to developer: the Flight List Report will require changes to List Server and may
    not be available for 7.5. Thus this option may be removed from the menu.]

- Then name of the FCA shall be shown in the window title.

- When the dialog box is opened, the time period covered by the timeline shall be from the
  current time interval (or FCA start time interval, which ever is later) to the end time
  interval of the FCA up to the default time range that is specified in the Set FEA/FCA
  Defaults dialog box.

- Each time interval shall be a 15-minute time period starting on the hour or 15, 30, or 45
  minutes past the hour as appropriate. [This is so that the timelines will be consistent with
  Monitor Alert timelines. This will allow the users to more easily use information from
  both Monitor Alert and FCA Timelines in their decision making process.]

- The dialog box shall be resizable horizontally so that the user can control the number of
  time intervals that are visible at one time. If all time intervals cannot be shown at one
  time, the TSD shall display scroll bars so that the user can control which time intervals
  can be viewed. The default size for the window shall be the width and height needed to
  display all time intervals defined by the Default Time Range that was specified in the Set
  FEA/FCA Defaults dialog box.

- The dialog box shall list the peak or total flight counts for each interval. These numbers
  shall be shown in the button for each interval. If there is no data for the interval, the TSD
  shall not display any number in the button. The TSD shall determine the flight counts
  shown in the Timeline based upon the data that is contained in the FCA Flights file. (See
  Section 2.14 for the algorithms to be used to determine these counts.)

- The TSD shall update the Timeline dialog box, dynamic list, and bar chart for each
  examined FCA whenever a new FCA Flights file is received for the FCA.

- The Timeline dialog box shall show the FCA Flights Indicator when the FCA Flights
  option has been selected. If the FCA Flights option is not selected, the Flight Indicator
  shall be shown crossed out to indicate to the user that the flights are not being shown.

- The Timeline dialog box shall show the time of the last flight data update for this FCA.
  The time shall be the time stamp of the FCA Flights file that is part of the name of the
  FCA Flights file. (i.e. fca_<fca name>.mmddhhmmss)

- The width of the dialog box shall be resizable so that the user shall be able to view a
  portion of the timeline. When only a portion of the timeline is visible, the dialog box
  shall provide scroll bars to allow the user to change the portion of the timeline that is
  visible.

- The height of the dialog box shall n̲o̲t̲ be resizable.

- The TSD shall allow the user to select a range of time periods (called Time Intervals) by clicking on either the time or count buttons. The Time Intervals selected shall be used to determine what flights shall be displayed when the FCA Flights function is invoked or what flights shall be included in an FCA Report request. The default shall be that all time periods on the timeline are selected. The TSD shall allow the user to select the range of time periods to be selected by the normal methods of selecting a time range. That is clicking and holding the mouse button down and dragging the pointer over the desired time intervals or by clicking on the first interval and shift clicking on the last interval. The TSD shall provide a visual indication of which elements are selected (possibly by shading the buttons).

  If the user drags the pointer beyond the right edge of the dialog box on the row that lists the counts, the TSD shall scroll the timeline to the right and select the newly visible intervals. If the user drags the pointer beyond the right edge of the dialog box on the row that shows the time, the TSD shall not scroll the timeline. (This is the default behavior of the XRT widget.)

- The TSD shall display the total number of flights in the selected intervals in the tool bar portion of the dialog box. [Note that this number is different from the number that one would get by adding up the totals for each of the selected intervals since a flight may be in the FEA/FCA during multiple intervals.]

- The TSD shall toggle the flight counts that are shown in the FCA Timeline and Chart between the peak occupancy counts and the total counts for the interval when the Flight Count button is pressed.

4.10   Bar Chart

The TSD shall display bar charts for specified FCAs that show the projected traffic demand for the FCA by fifteen-minute intervals over a specified time range. The bar chart display shall be invoked from the FEA/FCA Timeline dialog box.

Figure 4.10.1 shows a bar chart window for an FCA.
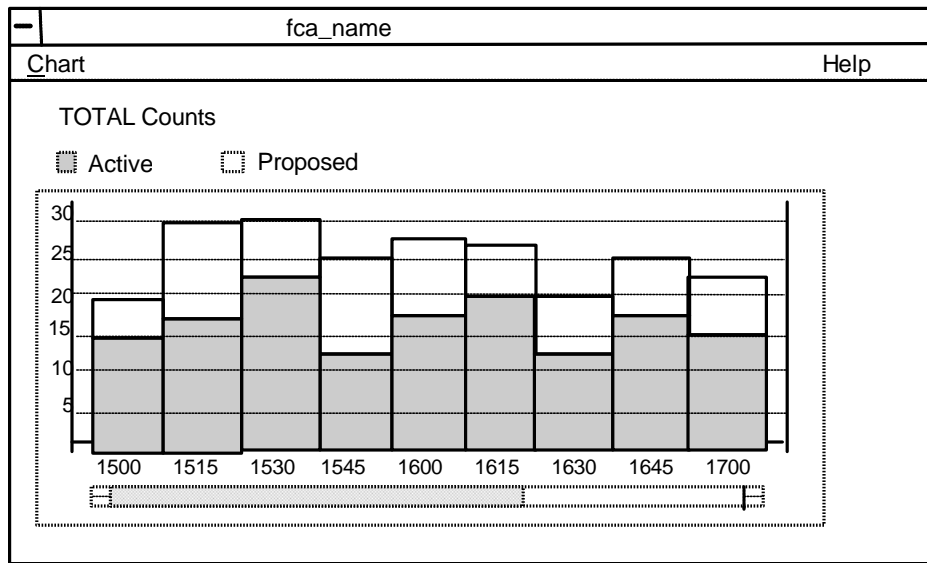
Figure 4.10.1   Sample FCA Bar Chart window.

The Bar Charts shall have the following characteristics:

- The bar chart shall be drawn in a separate window with a title bar that is labeled with the name of the FCA. The TSD shall allow the user to use the title bar to drag the bar chart window to any location. The user shall also be able to use standard X Windows techniques to resize the bar chart (within limits that are specified below).

- The bar chart shall display stacked bars to show the number of active, proposed and total flights projected for the element for each 15-minute interval for the time range specified for the element. The bar for proposed flights shall be shown above portion of the bar for active flights.

- The time axis shall be labeled with the starting time for the 15-minute time interval under the bar that corresponds to the interval.

- The Bar Chart shall indicate whether the flight counts represent the TOTAL or PEAK flight counts.

- The bar chart shall use colors to indicate the portions of the projected demands that are based upon active and proposed flights. The following colors shall be used:

        Red   Number of active flights
        Yellow   Number of proposed flights

- The bars shall be drawn with no space between them.

- The background color shall be adaptable and it shall be the same as the Alert Bar Chart background color. The light blue color shall be the hardcoded fallback default.

- The bar chart window shall be resizable in the horizontal direction using standard Motif methods. The window shall not be resizable in the vertical direction. When the window is resized horizontally, the width of the bars shall not change. The window size shall determine the number of bars that are visible at one time. The maximum horizontal size of the window shall be the lessor of the size needed to display all bars or the width of the display screen.

- The Bar Chart shall be displayable in two zoom scales. The smallest zoom scale shall use a bar width of ½ inch. The largest shall use a bar width of 1 inch. When the Bar Chart is initially displayed, it shall be displayed in the smallest zoom scale. The user shall be able to toggle between the two sizes using the Toggle Size menu option. The purpose of the larger zoom scale is to make it easier to read; the small zoom scale will be useful to monitor a particular FCA without taking up too much screen space.

- A bar chart shall have a window menu button in the upper left corner. The window menu shall provide the Close option. The Close option shall be the default.

- The bar chart window shall have a menu bar. The following menu options shall be provided:

    <u>T</u>ime Range
    Toggle Si<u>z</u>e
    <u>C</u>lose

- The TSD shall adjust the number of labels shown on the vertical axis to be equal to or less than 10 and number of horizontal grid lines that are displayed to be equal to or less than 20. (The intent of this requirement is to insure that the labels are easily readable regardless of the magnitude of the number of FCA flights.)

- When the Chart>Close menu option is selected; the TSD shall close the Bar Chart window.

- When the user clicks on a bar in the bar chart, the TSD shall display a balloon help window that shows the UTC start time of the bar, the total number of flights, and the count of active and proposed flights.

4.11 Drawing FCAs

This section describes how FCAs shall be drawn on the TSD display.

When FCAs are shown, the TSD shall draw all FCAs that have their "Show" check box checked in the Select FEA/FCA dialog boxes.

The TSD shall draw each FCA in the following manner:

1) The FCA shall be drawn in the color that is designated for the FCA.

2) When the FCA is being created or edited, each point of the FCA polygon shall be drawn as a circle icon similar to the icons currently used for drawing airports. Otherwise, the

TSD shall not draw the points of the polygon – just the line segments.

3) The line segments shall be drawn as the shortest great circle line between the end points of the line segment.

4) The FCA polygon shall be drawn at the location that is appropriate for the current time. If the current date/time is before the start date/time of the FCA, the FCA shall be drawn at the starting location. If the current date/time is after the end date/time of the FCA, the FCA shall be drawn at the ending location.

5) The FCA polygon shall be drawn using solid lines of 2 pixel width.

6) Except when the FCA is being created or edited, the TSD shall indicate the direction and speed of movement of the FCA by drawing outlines of the FCA polygon at projected future locations. These outlines shall be drawn using dotted lines. The TSD shall draw one outline polygon at the projected location at the end time. The TSD shall also draw outline polygons at three intermediate locations, equally spaced in time. The TSD shall not draw the outlines when the Create FEA/FCA or Edit FEA/FCA dialog box is being displayed for the FCA.

7) In Release 7.4, the TSD shall provide a pop-up menu that provides the user with the following options:

> Toggle Data Block
> Toggle Data Block Contents
> Examine
> Edit
> Deselect

The "Toggle Data Block Contents" option shall toggle the data block between the short form and the long form.

The TSD shall display the pop-up menu when the right mouse button is pressed while the FCA and data block are being highlighted.

The TSD shall gray out the Examine menu option if the FCA cannot be examined because it has expired.

The TSD shall gray out the Edit menu option if the user is not allowed to edit the FCA. This may occur if the FCA is Public and the user is not authorized to edit a Public FCA or if the FCA is Shared and the user's site is not the site where the FCA was created.

8) When the user double clicks on the highlighted FCA, the TSD shall execute the first pop-up menu option that is to toggle the data block ON/OFF.

9) When the long form data block for the FCA is selected, the TSD shall display the following information about the FCA:

> Name
> Upper and lower altitude
> Start and end date/time

Direction of movement (heading)
Speed of movement
Access level (Public, Shared, Private)
Type (Actual or Planned)
Time associated with the location where the FCA is drawn.

10) The TSD shall ignore single clicks of the left mouse button when the FCA is highlighted. A single click shall not select the FCA.

11) When the short form data block is selected for a stationary FCA, the TSD shall display the name of the FCA. When the short form data block is selected for a moving FCA, the TSD shall display the Name, Direction of movement, and Speed of the FCA.

12) Unless the FCA data block has been dragged to a new location, the TSD shall draw the FCA data block at a fixed offset in screen coordinates directly above the northern most point of the FCA. [Note to developer: Initially use the same offset that is used for flight data blocks. However the offset should be a parameter that can be changed easily.]

4.11.1 Dragging the FCA Datablock

The TSD shall allow the user to drag the datablock of each FCA to a new location on the display.

When the pointer is over an FCA line segment or the FCA datablock, the TSD shall highlight the FCA and its datablock. When the middle mouse button is pressed, the TSD shall position the FCA datablock at the pointer location. The TSD shall then drag the datablock to follow the pointer location if the pointer is moved while the middle mouse remains depressed. While the datablock is being dragged, the TSD shall draw a lead line (using a width of 1 pixel) from the datablock to the first point of the FCA.

4.12 FCA List Reports by Interval

The TSD shall request FCA List Reports by Interval from the List Server. These reports shall list the flights that are predicted to intersect the FCA within each 15-minute interval. The TSD shall provide two methods of obtaining these list reports. In the first method, the TSD shall allow the user to enter list requests in the TSD Command Line for FCA reports. In the second method, the TSD shall provide an FCA Report menu option in the FEA/FCA Timeline dialog box.

The TSD Command Line dialog box shall accept an FCA List Request. An FCA List Request will be the same as any other list request except that they will contain the keyword "FCA" and the *location* will be the FCA Name.

When the Report menu option in the FEA/FCA Timeline dialog box is selected, the TSD shall issue a request to the List Server with the following syntax:

{**REQ**} {**FCATA**} <FCA Name> <start date> <start time> <end time> @FCAFMT #END#

Start Date: The format for the start date shall be: mm/dd. The start date shall be the date of the first interval that has been selected in the FEA/FCA Timeline.

Start Time: The format for the start time shall be: hhmm. The start time shall be the beginning of the first time interval that has been selected in the FEA/FCA Timeline.

End Time: The format for the end time shall be: hhmm. The end time shall be the last minute of the last interval that has been selected in the FEA/FCA Timeline.

4.13   Display of FCA Flights

4.13.1 Display of Active FCA Flights

The TSD shall display all active flights that are predicted to intersect the FCA being examined using aircraft icons drawn in the FCA Flights color.

4.13.2 Display of Proposed Flights

The TSD shall display flights that are predicted to intersect the FCA being examined but have yet not departed (i.e. are still on the ground) using small circles at the airports where the flights are originating. The TSD shall also label the circle icons with the airport identifier and a set of three numbers as shown below:
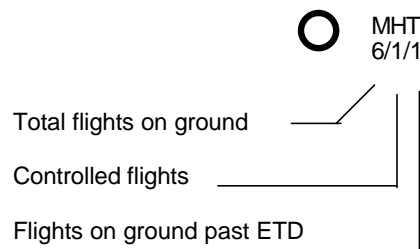
Figure 4.13.1   Circle Icons for Proposed Flights

The circle icon shall be drawn as a circle, 2 pixels wide and 8 pixels in diameter. The center of the circle shall show the alert color of the airport if it is alerted and it shall be empty if the airport is not alerted. For example, if the airport has a red alert, when the FCA Flights icon is drawn for the airport, the circle shall be drawn using the FCA flights color and the center of the circle shall show the airport as a filled circle icon in red.

If only one FCA is being examined, the TSD shall draw the circle icon and its label using the same color used to draw the active flight icons shown by the FCA Flights function. If multiple FCAs are being examined, it is possible that a circle icon could be associated with multiple FCAs. In that case, the TSD shall draw the circle icon and its label in the color of first FCA that is examined.

The first number in the set (Total flights on ground) shall be the total number of flights that are waiting to depart from this airport that will depart from, arrive at, or traverse the examined FCA during the time range that is selected in the Timeline dialog box.

The second number in the set (Controlled flights) shall be the number of flights that are currently controlled by a ground delay program and whose original departure time is already past.

The third number in the set (Flights on ground past ETD) shall be the numbers of flights whose ETD is already past but which have not yet departed.

4.13.3 Display of Data Blocks for Flights on the Ground

The TSD shall display the data block for the circle icons when any of the following events occur: (In general any of the events, that cause data blocks for active flights to be shown, shall also cause circle data blocks to be shown.)

1. When the pointer is browsed over the circle icon, the TSD shall display the data block for the icon as long as the icon is highlighted. Note that this implies that the circle icons shall be pickable and able to be selected.

2. When the icon is preselected or selected, the TSD shall display the Flight Icon Pop-up Menu when the right mouse button is clicked. The Pop-up menu shall provide the data block options that are described below. Just as with active flights, when an option is selected on the Flight Pop-up Menu, the TSD shall toggle the data block On/Off or draw the data block with the options specified. The following data block drawing options shall be provided on the Flight Pop-up menu:

    > Toggle Data Block
    > Show Org/Dest
    > Show Route
    > Draw Route
    > Data Block Color

3. The Flights>Customize menu option shall allow the user to toggle data blocks for all flight icons including the circle icons and define the content of the data blocks whenever they are shown.

The data blocks for circle icons shall contain data for flights that have not yet departed from the airport. Note that the data block may describe multiple flights. The TSD shall provide three options for displaying these data blocks:

- Flight data
- Flight data with Org/Dest
- Flight data with Route

(Note: The Show Org/Dest and Show Route options shall be mutually exclusive.)

In the first option, shown in Figure 4.13.2, the TSD shall display the basic data for each flight using one line for each flight. This data block lists the Flight ID and the Estimated Time of Departure for each flight and, if controlled, the original (planned) departure time. Each line shall contain the Flight ID followed by one or two time values. A single character that may be "P", "C", or "S" precedes each time value. The character "P" denotes the planned departure time. The character "C" denotes the controlled departure time. The character "S" denotes the scheduled departure time.

The first time value shall be the Estimated Time of Departure, which may be the planned, controlled, or scheduled departure time. If the flight is controlled, the data block shall list the controlled time followed by the planned departure time.

As with any other flight data block, the data blocks for circle icons may also show the origin and destination or the route of each flight. The same mechanisms that control the content of flight data blocks shall also control the content of the data blocks for circle icons. That is the Flights>Customize functions shall allow the user to specify whether the origin/destination or the route shall be displayed in the data blocks. The TSD shall also allow the user to change the content of the data blocks using the pop-up menu.

The data block for a circle icon may describe multiple flights. The data blocks shall list the Estimated Time of Departure for each flight and, if controlled, the original (planned) departure time. The flights shall be sorted in the order of the estimated departure time. Figure 4.13.2 shows the data block without the origin/destination or the route shown. Figure 4.12.3 shows the data block with the org/dest being shown. Figure 4.12.4 shows the data block with the route being shown.

```
GAA537    P1505
ALO3956   C1530   P1505
PRE3503   C1531   P1510
GAA353    C1545   P1445
ALO3527   C1610   P1600
PRE3509   S1615


     O    MHT
          6/4/1
```

Figure 4.13.2   Data Block Showing Basic Flight Data

```
DAL537    P1505
MHT CVG
ALO3956   C1530   P1505
MHT CVG
PRE3503   C1531   P1510
MHT CVG


     O    MHT
          3/2/1
```

Figure 4.13.3   Data Block Showing Origin and Destination for Each Flight

```
DAL537    P1505
LGA..LANNA.J48.MOL.MACEY.ATL/0150
ALO3956   C1530   P1505
LGA..LANNA.J48.MOL.MACEY.ATL/0155
PRE3503   C1531   P1510
LGA..LANNA.J48.MOL.MACEY.ATL/0155


     O    LGA
          3/2/1
```

Figure 4.13.4   Data Block Showing the Route for Each Flight

If the route is shown, the TSD shall display the entire route for each flight. The TSD shall use as many lines as necessary to display the entire route for each flight. Each line shall contain up to approximately 64 characters.

If the Draw Route option has been specified, the TSD shall draw the route from the origin to destination for all flights listed in the data block whenever the data block is shown.

In some cases, there may not be enough room on the screen to show the entire data block. This may happen when the airport is near the edge of the screen or when there are many flights that have not yet departed. In this case the TSD shall draw as much of the data block on the screen as possible.

The TSD shall allow the user to drag data blocks for circle icons to another location using the same techniques that are used for dragging the data blocks for active flights.

The Data Block color option on the pop-up menu shall change the color of the selected data block. When the option is selected, the TSD shall display the color palette that will allow the user to choose the color for the data block.

4.14   FEA/FCA Dynamic List

The FEA/FCA Dynamic List shall be displayed when the Dynamic List option is selected on the FEA/FCA Timeline. This dialog box is shown below in Figure 4.14.1.

FEA_NAME - FEA/FCA Dynamic List						
File Functions						Help
Active: 25 Inactive: 30 Total: 55					Updated At: 1230	
ACID	NRP	Time Of	ETD	ORIG	DEST	Route
AAL123	NRP	1330	A1251	DFW	DCA	DFW-FINKS6-DCA
AAL456		1331	A1255	DFW	BWI	DFW-TEX7-BWI
AAL644		1332	A1245	DFW	IAD	DFW-DALL6-SQS-IAD
DAL1234	NRP	1333	P1300	DFW	DCA	DFW-FINKS6-DCA
UAL123	NRP	1334	P1310	DFW	DCA	DFW-FINKS6-DCA
UAL345		1335	S1400	DFW	BWI	DFW-TEX7-BWI
UAL5679		1335	S1410	DFW	IAD	DFW-DALL6-SQS-IAD

Figure 4.14.1   FEA/FCA Dynamic List Dialog Box

The FEA/FCA Dynamic List dialog box shall have the following characteristics:

- The TSD shall update the FEA/FCA Dynamic List whenever the FCA Timeline is updated.

- When the list is updated, the TSD shall maintain the scroll position of the list after the update. [Note to developer: Displaying the same row numbers before and after the update will satisfy this requirement.]

- The name of the FEA/FCA shall be shown in the title of the dialog box.

- The dialog box shall display one entry in the list for each aircraft that is predicted to intersect the FEA/FCA during the intervals that have been selected in the FEA/FCA

timeline.

- The dialog box shall provide the following options on the File menu:

  > Save Report
  > Print Report
  > Close

- The dialog box shall provide the following tool bar buttons:

  > Save
  > Print
  > Hold

  When the Save tool bar button is pressed the TSD shall save the report. When the Print tool bar is pressed the TSD shall print the report.

  When the Hold button is pressed, the TSD shall stop updating the data in the list. The Hold button shall change to "Resume" and the TSD shall display the word "HOLD" next to the update time. When the Resume button is pressed, the TSD shall resume updating the list starting with the most recent update and the TSD shall remove the word "HOLD".

- The dialog box shall provide the following options on the Functions menu:

  > Customize Columns
  > Sort

  When the Customize Columns option is selected the TSD shall display the Customize Columns dialog box. When the Sort option is selected the TSD shall display the Sort FEA/FCA dialog box.

- The dialog box shall display the following summary information in the header above the list:

  > Total number of flights in the list.
  > Total number of active flights in the list.
  > Total number of inactive flights in the list.
  > Time that the data in the list was last updated.

- When the list is sorted by ACID, the TSD shall sort the list alphabetically by airline code and then numerically by the flight number. [e.g. AAL567 shall be sorted before AAL1234]

- When the FEA/FCA Timeline dialog box is closed (and the TSD ceases to examine the FEA/FCA), the TSD shall close the FEA/FCA Dynamic List if it is being displayed for that Timeline.

- The TSD shall allow the user to change the column widths by clicking and dragging the column separators.

- The TSD shall allow the user to resize both the height and width of the dialog box. The TSD shall display scroll bars as necessary if all of the data is not visible in the dialog box.

- When the Help menu option is selected, the TSD shall display the following file in the standard help display dialog box: */etms/tsd/help/DynamicList.hlp.*

- All time values shall be displayed in hhmm format except for the "Time To" value which shall be displayed in the format hh:mm [Note to developer: The seconds field has been removed for 7.5.].

- The data in each column shall be left justified.

- The Menu Background Color option in Customize Colors shall control the color of the dialog box. The background color of the list portion of the dialog box shall be white.

- If the list takes more than a few seconds to display, the TSD shall display a dialog box with the following message: "FEA/FCA Dynamic List is initializing. Please wait." The TSD shall remove this dialog box when the list is displayed.

- Table 4.14 lists the data items that shall be available to be displayed in the FEA/FCA Dynamic List. This table also lists the column header and default column width that the TSD shall use to display each type of data.

- The TSD shall display the estimated departure time when the Departure Time column is displayed. For Active flights, the TSD shall show the departure time with the prefix of 'A'. For inactive flights, the TSD shall display the departure time with the appropriate letter prefix of 'C', 'P', or 'S'. The TSD shall determine which time value and prefix to display based upon the following algorithm:

If	Controlled Departure Time > –1,	then the TSD shall display the departure time value with the Prefix = C
Else if	Proposed Departure Time > -1,	then the TSD shall display the departure time value with the Prefix = P
Else if	Scheduled Departure Time > -1,	then the TSD shall display the departure time value with the Prefix = S
Else	Prefix = none	then the TSD shall display the departure time value without a prefix

[Note to developer. The code in FlightObj::GetIdString in Flight.C implements this algorithm for the inactive flight data blocks.]

- When a row is selected in the Dynamic List the entire row shall be highlighted. This will allow the user to keep track of the selected row when the list is scrolled horizontally.

- The TSD shall display the ACID of active flights using the Motif color "LightSeaGreen" and inactive flights in the Motif color "orangered". (Note to developer: These colors should be defined as an X application resource so that they can be changed easily during testing.)

When the **File>Save Report** menu option is selected, the TSD shall create an ASCII report that contains the data that is being displayed in the list at the current time in the order that it is being displayed. [That is, the sort order and column order shall be maintained in the report.] The format of this report is described in the following section. The TSD shall save the file in the */reports* directory using the following naming convention:

> <fcaname><.>{fcalist}<.><current day/time>

> i.e. FEA_ZKC21.fcalist.12131545

where: <fcaname> shall be the complete name of the FEA/FCA
       <current day/time> shall be formatted as ddhhmmss

[By saving the report in the *reports* directory, Report Manager can be used to view the report at a later time.]

When the **File>Print Report** menu option is selected, the TSD shall create an ASCII report as described above and save this file in the */reports* directory. The TSD shall then display the Print dialog box [same one used by Report Manager]. The default print command shall be: */etms/shared/config/print_script*. The default number of copies shall be one.

When the **File>Close** menu option is selected, the TSD shall close the Dynamic List dialog box.

When the **Functions>Customize Columns** menu option is selected, the TSD shall display the Customize Columns dialog box (see Section 4.14.1). The purpose of this dialog box is to allow the user to specify which columns are included in the list and the order in which those columns are displayed.

4.14.1 Report Format for FEA/FCA Dynamic List

The section describes the format for the ASCII report that the TSD shall create when the File>Save Report or File>Print Report menu options are selected in the FEA/FCA Dynamic List dialog box.

The maximum line width shall be 85 characters. If the line is longer than 85 characters, the TSD shall word wrap the line.

The first line of the report shall include the following information with a single space between each item:

> FEA/FCA Name
> Start Date of the FEA/FCA (mm/dd)
> Start Time of the FEA/FCA (hhmm)
> End Date of the FEA/FCA if different from the start date (mm/dd)
> End Time of the FEA/FCA (hhmm)
> 5 spaces

"CURRENT TIME:"
Current Date (mm/dd)
Current Time (hhmm)

The second and third lines shall be skipped.

The column headers shall be written into the fourth line. Each column header shall be left justified. The column width shall be the same number of characters as the column width in the Dynamic List dialog box.

The data in the list shall be written into the report in the same order as it appears in the Dynamic List dialog box. If the number of characters for the data in any column except the last column exceeds the column width of the column, the TSD shall truncate the data for that column. The TSD shall include only the columns that are displayed in the Dynamic List in the report.

4.14.2 Customize Columns Dialog Box

The TSD shall display the Customize Columns dialog box when the Functions>Customize Columns menu option is selected in the FEA/FCA Dynamic List dialog box. This dialog box is shown in Figure 4.14.2.
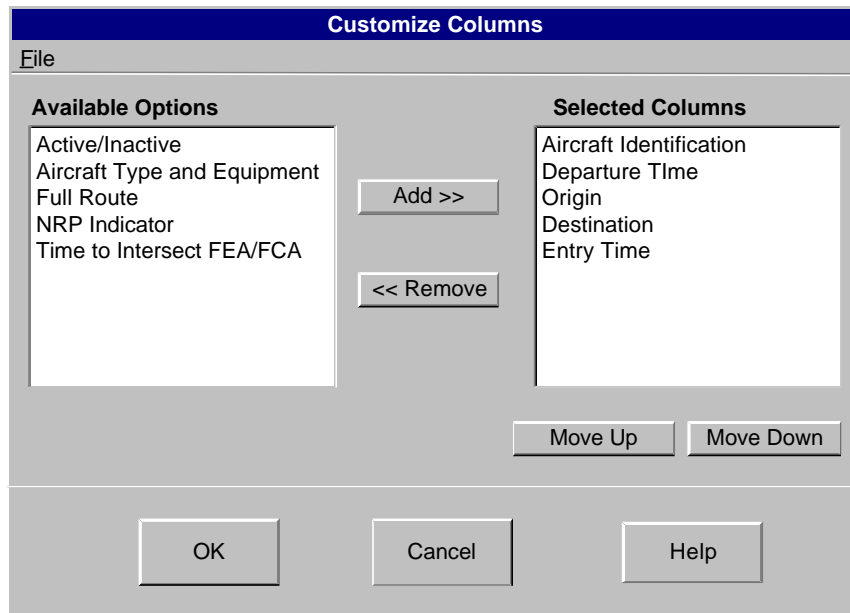
Figure 4.14.2   Customize Columns Dialog Box

The purpose of the Customize Columns dialog box is to allow the user to specify which columns will be displayed in the FEA/FCA Dynamic List and the order of those columns.

The Customize Columns dialog box shall show two lists – one for Available Options and the other for Selected Columns. The Available Options list shall include all available data items that are not currently included in the Selected Columns list. The data items in the Available Options list shall be sorted alphabetically in ascending order. The Selected Columns list shall be the list of data items that the TSD shall display in the FEA/FCA Dynamic List.

When the dialog box is opened for the first time, the items that the TSD shall include in each list shall be defined by the adaptation file in the */etms/tsd/adapt/fcalist* directory that the TSD read when it initialized or when the adaptation file was last recalled. If the *fcalist* adaptation file was not available or if these parameters were not defined in the *fcalist* adaptation file, the TSD shall display the default column selection that is specified in Table 4.14.

The TSD shall allow the user to select items in these lists using the standard selection methods. A single click shall toggle the selection state of the item and deselect all other selected items. Ctrl-click shall toggle the selection state of the item and not change the selection state of other selected items. Click and Shift Click shall select the range of items from the item clicked to the item Shift Clicked.

When the **Add >>** button is clicked, the TSD shall append all data items that are selected in the Available Options list to the bottom of the Selected Columns list and the TSD shall remove those items from the Available Options list.

When the **<< Remove** button is clicked, the TSD shall add the all data items that are selected in the Selected Columns list to the Available Options list. The items in the Available Options list shall be sorted alphabetically in ascending order.

When the **Move Up** or **Move Down** buttons are pressed, the TSD shall determine if one and only one item has been selected. If no items or more than one item has been selected, the TSD shall display the error dialog box. If only one items has been selected, the selected item in the Selected Columns list shall be moved up/down by one position in the list. The selected item shall remain selected after the move up/down operation so that the user can move the item again.

When the **OK** button is pressed, the TSD shall change the columns in the FEA/FCA Dynamic List according to the list of items in the Selected Columns list. The TSD shall close the Customize Columns dialog box and remember the columns that have been selected. The next time an FEA/FCA Dynamic List dialog box is opened, the columns in the Dynamic List shall be the same as the columns that were selected when the Customize Columns dialog box was closed with an OK.

When the **Cancel** button is pressed, the TSD shall close the Customize Columns dialog box and discard any changes that were made to the column selection.

When the **Help** button is pressed, the TSD shall display the standard Help window and display the file: */etms/tsd/help/CustomizeColumns.hlp*.

The TSD shall save and recall the preference settings using the standard adaptation functions as described in Section 2.11. The TSD shall provide the standard File>Recall, File>Save, and File>Delete menu options on the FEA/FCA Customize Columns dialog box.
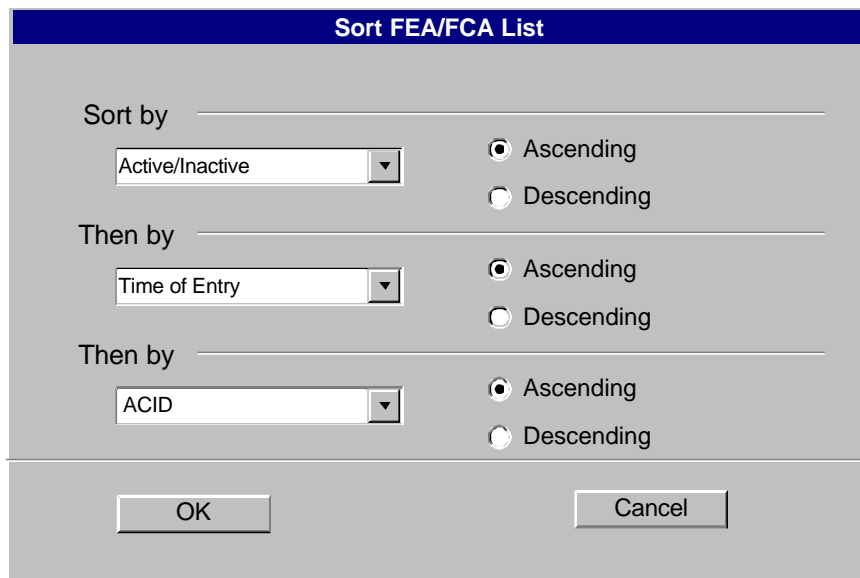
Table 4.14　　　Data Items for Display in the FEA/FCA Dynamic List

Data Item	Header	Width (Char)	Units or Format	Default Column	Release 7.4	Description
Aircraft ID	ACID	8	char	1	*	Aircraft Identification
FEA/FCA Name	FEA	12	char			Name of the FEA/FCA
Aircraft Type and Equipment	TYPE	12		Available	*	Aircraft Type and Equipment <prefix_char>/<ac_type>/<suffix_char>
NRP Indicator	NRP	4	'NRP' or blank	Available	*	Indicator if this is an NRP flight 'NRP' if LSB of <remarks_flag> is set otherwise 'blank'
Current ARTCC	ARTCC	6	char			ARTCC where flight is currently located or departure ARTCC for inactive flights
Departure Time	ETD	5	hhmm	4	*	Actual Departure Time or proposed departure time for inactive flights
Active/Inactive	STAT	5		Available	*	'A' for active flights and 'P' for inactive flights
Origin	ORIG	6	char	2	*	Departure Airport
Destination	DEST	6	char	3	*	Arrival Airport
Full Route	ROUTE	30	char	6	*	Complete field 10 route
Abbreviated Route	ROUTE	15	char		*.	Route that has been abbreviated using the Mitre CRCT algorithm
Time to Intersect	TIME TO	6	hh:mm	Available	*	Time to intersect the FEA. The value shall be '0:00:00' if the flight has already intersected the FEA.
Entry Time	ENTRY	6	hhmm	5	*	Time when the flight is predicted to first intersect the FEA.
Altitude	ALT	4	nnn			Trajectory altitude at the point where the flight intersects the FEA/FCA in hundreds of feet.

Notes: The items marked with an asterisk in the Release 7.4 column shall be column options for Release 7.4. The all other items shall be deferred as column options for a future release. The items listed with "Available" as the Default Column shall be included in the Available Options list.

4.14.3 Sort FEA/FCA List Dialog Box

The TSD shall display the Sort FEA/FCA List dialog box when the Functions>Sort menu option is selected in the FEA/FCA Dynamic List dialog box. This dialog box is shown in Figure 4.14.3.

Figure 4.14.3   Sort FEA/FCA List Dialog Box

The purpose of the Sort FEA/FCA List dialog box is to allow the user to sort the items in the FEA/FCA Dynamic List. This dialog box shall allow the user to specify the primary, secondary, and tertiary sort order. For each level of sort, the TSD shall allow the user to select from any column option regardless of whether the column is being displayed in the list. In addition, the TSD shall allow the user to specify NONE for the secondary and tertiary sort options that shall disable that sort option.

The default primary sort order shall be in ascending order by ACID. The default secondary and tertiary sort order shall be NONE.

When the OK button is clicked, the TSD shall sort the list according to the sort order that is specified in the dialog box. The user shall also be able to sort the list by clicking on a column header. These two methods of sorting shall be independent of one another. That is, the list shall be sorted according to the method last used.

4.15   End Time Warning Dialog Box

Under certain circumstances, the TSD shall display the FEA/FCA End Time Warning dialog box when the End Time of an FCA becomes less than 30 minutes in the future. The circumstances under which the TSD shall display this dialog box are listed in Section 2.10.

The FEA/FCA End Time Warning dialog box is shown in Figure 4.15.1.

```
┌─────────────────────────────────────────────────────────────┐
│ │          FCA End Time Warning                               │
├─────────────────────────────────────────────────────────────┤
│                                                               │
│   FCA XXXXX will expire within 30 minutes                     │
│                                                               │
│  ──────────────────────────────────────────────────────────  │
│                                                               │
│   ┌───────────┐      ┌───────────┐      ┌───────────┐         │
│   │   Edit    │      │  Cancel   │      │   Help    │         │
│   └───────────┘      └───────────┘      └───────────┘         │
└─────────────────────────────────────────────────────────────┘
```

Figure 4.15.1   FEA/FCA End Time Warning Dialog Box

When the FCA alarm is triggered, the TSD shall display the FEA/FCA End Time Warning dialog box with the name of the FCA inserted into the text of the message in place of XXXXX. When this occurs, the TSD shall show the FCA that will be expiring on the display and the FCA shall be shown as flashing. The TSD shall flash a FCA by periodically alternating the color of the FCA between the highlight color (white or black) and the FCA color. When the TSD shows the FCA, it shall turn ON the Show check box in the Select FCA dialog box.

When the **Edit** button is pressed, the TSD shall close the FEA/FCA End Time Warning dialog box and display the Edit FEA/FCA dialog box for the FCA that will be expiring. The TSD shall also stop flashing the FCA.

When the **Cancel** button is pressed, the TSD shall close the FEA/FCA End Time Warning dialog box and stop flashing the FCA. The FCA shall remain being shown.

When the **Help** button is pressed, the TSD shall display the appropriate context sensitive help file.

If the FEA/FCA End Time Warning dialog box is being displayed at the time when the FCA is deleted (by this or another user), the TSD shall close the FEA/FCA End Time Warning dialog box and remove the FCA from the display. When this occurs, the TSD shall display a notification to the user that the FCA was deleted.

If the FEA/FCA End Time Warning dialog box is being displayed at the time when the FCA is edited (by this or another user) such that the end time is more than 30 minutes in the future, the TSD shall close the FEA/FCA End Time Warning dialog box and stop the FCA from flashing. When this occurs, the TSD shall display a notification to the user that the FCA was modified.

If the user selects the Hide FEA/FCA menu option, the TSD shall close all FEA/FCA End Time Warning dialog boxes that are being displayed.

5.0   Error Handling

The TSD shall display the error dialog box, shown in Figure 5.1, if an error is encountered.

```
 _____
| _ |            Error                      |
|___|_____    |
|                                           |
|       Error Message                       |
|                                           |
|               _____         |
|              |      OK           |        |
|              |_____|        |
|_____|
```
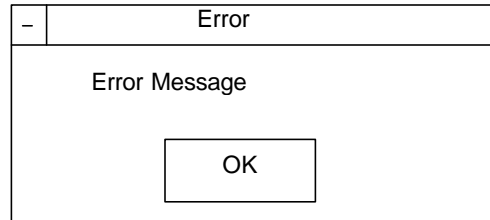
Figure 5.1   Error Dialog Box

When this dialog box is opened, keyboard focus and the pointer shall be on the **OK** button so that pressing **<Return>** of clicking the mouse will close the dialog box. The **<Esc>** key shall also close the dialog box. This window shall remain on the screen until the user closes it.

The following are the error messages that shall be displayed in the Error dialog box:

1. If the TSD attempts to draw a FCA and determines that the FCA is not valid, the TSD shall display the following error message:

    <name> FEA/FCA is invalid

2. If an error occurs when the TSD attempts to read the FCA Index or FCA Data file, the TSD shall display the following error message:

    Error reading file: <file name>

3. If no FCA has been selected in the Select FEA/FCA dialog box for any of the functions that require this selection, the TSD shall display the following error message:

    No FEA/FCA has been selected

4. If more than one FCA has been selected in the Select FEA/FCA dialog box for the Edit or Copy FEA/FCA functions, the TSD shall display the following error message:

    More than one FEA/FCA has been selected

5. When creating an FCA, if the name is the same as an existing FCA, the TSD shall display the following error message:

    Duplicate FEA/FCA name

6. When creating or editing an FCA, if the End date/time is not greater than the current date/time or is greater than 15 hours in the future, the TSD shall display the following error message:

End Time must be after the current time but less than 15 hours in the future.

7. When creating or editing an FCA, if the End date/time is not greater than the Start date/time by at least 15 minutes, the TSD shall display the following error message:

    End Time must be greater than Start Time by at least 15 minutes.

8. When creating or editing an FCA, if the polygon doesn't have at least 3 points, that TSD shall display the following error message:

    The polygon must have at least 3 points.

9. When creating or editing an FCA, if the polygon is not a simple polygon (sides cross), the TSD shall display the following error message:

    Polygon has sides that cross

10. When creating the FCA polygon, if the user has tried to enter more than 64 points, the TSD shall display the following error message:

    FEA/FCA Polygon has more than 64 points.

11. When the TSD validates the pathname to the FCA files on the workstation that is specified in the FCA Defaults dialog box and the pathname is invalid, the TSD shall display the following error message:

    Invalid pathname for FEA/FCA Files. The workstation may not exist or the fca_files directory may not exist on the workstation.

6.0   Implementation Issues

1. Create the directory */etms/tsd/adapt/fcalist*.

2. Distribute a new fcalist 'defaults' adaptation file with the software.

7.0   Issues for the FAA

1. None at this time.

APPENDIX A NWA Message Types by Function

The following table relates the message types to the functions that are to be performed.

Function	Sender	Recipient	NWA Message Type	TSD Message Type	Message Syntax
Confirmation messages in reply to TSD requests	RRHUB	TSD	NWA_FCA_CONFIRM_ID	FCA_CONFIRM_reply	Confirmation message
Error messages in reply to TSD requests	RRHUB	TSD	NWA_FCA_ERROR_ID	FCA_ERROR_reply	Error message
Heartbeat messages	RRSVR	TSD	NWA_FCA_INDEX	FCA_INDEX_periodic	FCA Index
FCA update notification	RRSVR	TSD	NWA_FCA_UPDATE	FCA_UPDATE_notify	Update FCA
FCA Delete notification	RRSVR	TSD	NWA_FCA_DELETE	FCA_DELETE_notify	Delete FCA
Responses to requests for index data	RRSVR	TSD	NWA_FCA_INDEX_ID	FCA_INDEX_reply	FCA Index
Responses to requests for FCA data	RRSVR	TSD	NWA_FCA_UPDATE_ID	FCA_UPDATE_reply	
TSD sends update messages to RRSVR	TSD	RRSVR	NWA_FCA_UPDATE_ID	FCA_UPDATE_request	Update FCA
TSD sends delete messages to RRSVR	TSD	RRSVR	NWA_FCA_DELETE_ID	FCA_DELETE_request	Delete FCA
TSD requests index data	TSD	RRSVR	NWA_FCA_REQUEST_INDEX_ID	FCA_INDEX_request	FCA Index Request
TSD requests FCA data	TSD	RRSVR	NWA_FCA_REQUEST_DATA_ID	FCA_DATA_request	FCA Data Request
TSD requests List Report	TSD	LSTNET	NWA_LIST_REQ	??	
TSD requests Flight Data	TSD	FCATA	NWA_FCATA_REQUEST_ID	FCA_FLIGHT_DATA_request	FCA Flight Data Request
List Server Report	LSTNET	TSD	NWA_LIST_REPLY	??	
Flight Data from FCATA	FCATA	TSD	NWA_FCATA_REPLY_ID	FCA_FLIGHT_DATA_reply	FCA Flight Data

APPENDIX B Relationship of Response Messages to Request Messages for RRSVR

This table lists the message types that shall be returned by the RRSVR (or the RRHUB) when responding to messages from the TSD.

Request Message Type	Reply Message Type	Comment
NWA_FCA_REQUEST_INDEX_ID	NWA_FCA_ERROR_ID NWA_FCA_INDEX_ID	
NWA_FCA_REQUEST_DATA_ID	NWA_FCA_ERROR_ID NWA_FCA_UPDATE_ID	
NWA_FCA_UPDATE_ID	NWA_FCA_ERROR_ID NWA_FCA_CONFIRM_ID	
NWA_FCA_DELETE_ID	NWA_FCA_ERROR_ID NWA_FCA_CONFIRM_ID	

APPENDIX C Format of the FCA Flight Data File from the FCATA

The Flight Data File from the FCATA shall consist of three records for each flight as shown below.

Record	Description
1	Flight Data
2	Full Route
3	Abbreviated Route

```c
/*

  C data structure for the fca file produced by fcata and used by tsd
  The file name shall be: fca_<fca name>.mmddhhmmss.
  -

*/
#include <time.h>

typedef struct fcata_header_t
{
  int       version;          /* fcata version null terminated */
  char      fca_id[64];       /* fca id null terminated */
  char      fca_name[32];     /* fca name null terminated */
  time_t    start_time;       /* start date/time of the flight list */
  time_t    end_time;         /* end time/date of the flight list */
} fcata_header;

typedef
struct flight_fca_t
{
  long      flight_index;     /* Flight Index */
  char      acid[11];         /* Aircraft Identifier null terminated */
  char      dep_air[6];       /* Departure Airport  null terminated */
  char      arr_air[6];       /* Arrival Airport null terminated  */
  char      ac_type[5];       /* Aircraft Type  null terminated */
  char      active;           /* Active field – one char – see below */
  time_t    entry_time;       /* FCA entry time in seconds */
  time_t    exit_time;        /* FCA exit time in seconds */
  short     entry_heading;    /* Heading at entry into FCA – degrees */
  time_t    dep_schedule;     /* Scheduled departure time or 0 (sec)*/
  time_t    dep_proposed;     /* Proposed departure time, (seconds) */
  time_t    dep_estimate;     /* Estimated departure time, (seconds) */
  time_t    dep_controlled;   /* Controlled departure time, (seconds)*/
  time_t    ogtd;             /* Original Gate time of departure (sec)*/
  time_t    arr_estimate;     /* Estimated arrival time (seconds) */
  short     altitude;         /* Altitude in 100 feet */
  short     altitude_filed;   /* Filed altitude in 100 feet */
  char      weight_class;     /* 'S', 'L', or 'H' or otherwise 'U' */
  short     remarks_flags;    /* Field 11 comments flags - see comment*/
  char      air_category;     /* Aircraft category see comment below */
  char      user_category;    /* User category - see comments below */
  char      arrival_ctr;      /* Arrival Center */
  char      depart_ctr;       /* Departure Center */
  unsigned short waypoints;   /* # of 4-byte waypoints in flight's rte */
  unsigned short sectors;     /* # of 6 byte sectors in flight's rte */
  unsigned short fixes;       /* # of 6 byte fixes in flight's route */
```

```
    unsigned short airways;      /* # of 6 byte airway identifiers */
    unsigned short centers;      /* # of 3 byte ARTCC identifiers */
    unsigned short field_10_size; /* Size of field 10 in flight's route */
    char       num_aircraft;     /* num aircraft if this is a formation, */
                                 /* otherwise space */
    char       prefix_char;      /* Field 3 aircraft type prefix char */
    char       suffix_char;      /* Field 3 aircraft type suffix char */
    unsigned short route_size;   /* Size of field 10 (flight's route) */
    unsigned short abr_route_size; /* Size of string for flight's abbreviated */
                                 /* route */
} flight_fca;

/*
  Two route records should follow each flight_fca_t and both will be a null
    terminated
  char array of length = flight_fca_t.route_ptr_size;
  char array of length = flight_fca_t.abr_route_ptr_size;
*/

/* NOTES:
    FLAGS : 0 = MILITARY FLIGHT IF SET
            1 = CATEGORY 1 ('S') OF AIRCRAFT
            2 = CATEGORY 2 ('L') OF AIRCRAFT
            3 = CATEGORY 3 ('H') OF AIRCRAFT
            4 = received cancel msg
            5 = received critical msg
            6 = received position msg
            7 = received route msg
            8 = received time msg
            9 = received ttm ftm msg
            10 = received tz msg
            11 = received block alt msg
            12 = received raw tz msg
            13 = received raw dz msg
            14 = flight is ghosting, or was ghosting at time of deactivation
            15 = In a hold state, same lat/lon on consecutive TZ msgs

    SOURCE_FLAGS : 0 = DZ
                   1 = FZ
                   2 = UZ
                   3 = AF
                   4 = FS
                   5 = AZ
                   6 = RS
                   7 = RZ
                   8 = TO
                   9 = FC
                   10 = FX
                   11 = FM
                   12 = EDCT
                   13 = 5-SETBACK
                   14 = SI-CANCEL
                   15 = CTL-CANCEL
            to include TZ here would be redundant - it has its own flag
                already in FLAGS

    AIR_CATEGORY   : ' ' = not determined
                     'P' = piston
                     'T' = turbo
                     'J' = jet

    USER_CATEGORY  : 'O' = other
                     'T' = air taxi
```

```
                        'F' = cargo
                        'C' = commercial
                        'G' = general aviation
                        'M' = military
                        ' ' = not determined

         UPDATE_TYPE :
           'A' - Last update was AF
           'B' - Last update was 5 minute setback
           'D' - Last update was DZ
           'E' - Last update was EDCT
           'F' - Last update was FZ
           'G' - Last update was RAW_TZ
           'H' - Last update was Control Cancel
           'I' - Last update was Critical Msg
           'J' - Last update was RAW_DZ
           'K' - Last update was Block Altitude Msg
           'L' - Last update was AZ
           'M' - Last update was Ttm_ftm Msg
           'N' - Last update was FM
           'O' - Last update was TO
           'P' - Last update was FX
           'R' - Last update was RS
           'S' - Last update was FS
           'T' - Last update was TZ
           'U' - Last update was UZ
           'Q' - Last update was FC
           'X' - Last update was SI Cancel
           'Z' - Last update was RZ


         WAYPOINTS - number of 4 byte binary entries, in LAT/LON format of
                       degrees*60+min
         SECTORS   - number of 6 byte ASCII entries, left justified, blank filled,
                       its starting address is pointed to by
                        SEEK_KEY + WAYPOINTS*4
         FIXES     - number of 6 byte ASCII entries, left justified, blank filled,
                       its starting address is pointed to by
                        SEEK_KEY + WAYPOINTS*4 + SECTORS*6
         AIRWAYS   - number of 6 byte ASCII entries
                        its starting address is pointed to by
                        SEEK_KEY + WAYPOINTS*4 + SECTORS*6+FIXES*6
         CENTERS   - number of 3 byte ASCII entries
                        its starting address is pointed to by
                        SEEK_KEY + WAYPOINTS*4 + SECTORS*6 + FIXES*6 + AIRWAYS*6
         field_10_SIZE- number of ASCII bytes,
                     starting address is pointed to by
                        SEEK_KEY + WAYPOINTS*4 + SECTORS*6+FIXES*6 + AIRWAYS*6 +
                         CENTERS*3
         route_PTR_SIZE is:
                        WAYPOINTS*4 + SECTORS*6+FIXES*6 + AIRWAYS*6 +
                         CENTERS*3 + field_10_SIZE


         ACTIVE:
             'A' - Active flight, has received a TZ, DZ, (or FZ with a 'D' in
                    departure)
             'P' - Proposed flight, has received a UZ,FZ,AF waiting on TZ, DZ, etc.


         PREFIXES for EQUIP and E_TYPE:
              A/        # future prefix
              B/        # Both Heavy and TCAS prefix
              C/        # future prefix
              D/        # future prefix
              E/        # future prefix
```

```
     F/           # prefix
     G/           # future prefix
     H/           # Heavy prefix
     I/           # future prefix
     J/           # future prefix
     K/           # future prefix
     L/           # Large prefix
     M/           # future prefix
     N/           # future prefix
     O/           # future prefix
     P/           # future prefix
     Q/           # future prefix
     R/           # future prefix
     S/           # future prefix
     T/           # TCAS prefix
     U/           # future prefix
     V/           # future prefix
     W/           # future prefix
     X/           # future prefix
     Y/           # future prefix
     Z/           # future prefix


SUFFIXES for EQUIP and E_TYPE:
     /A           # DME, transponder with altitude encoding
     /B           # DME, transponder with no altitude encoding
     /C           # RNAV, transponder with no encoding capability
     /D           # DME, no transponder
     /E           # future suffix
     /F           # future suffix
     /G           # FMS, flight mgmt system, EFIS (electronic flight info sys)
     /H           # future suffix
     /I           # future suffix
     /J           # future suffix
     /K           # future suffix
     /L           # future suffix
     /M           # TACAN-only, no transponder
     /N           # TACAN-only, transponder with no altitude encoding
     /O           # future suffix
     /P           # TACAN-only, transponder with altitude encoding
     /Q           # future suffix
     /R           # RNAV,  transponder with altitude encoding
     /S           # future suffix
     /T           # Transponder with no altitude encoding
     /U           # Transponder with altitude encoding
     /V           # future suffix
     /W           # RNAV,  with no transponder
     /X           # no transponder
     /Y           # future suffix
     /Z           # future suffix


TYPES of REMARKS_FLAGS:     (such that 0 is the least significant bit)


   REMARKS KEYWORD          BIT
     NRP                     0
     LIFEGUARD               1
     CATIII                  2
     ALTRV                   3
     SWAP                    4
     DVRSN                   5
     ADCUS                   6
     3DUPT                   7
     WXRTE                   8
```

```
*/
/*===================================================================*/
```